BIG CREEK REGION CONSERVATION REPORT 1963

SUMMARY

ONTARIO

DEPARTMENT OF LANDS AND FORESTS

HON. A. KELSO ROBERTS, Q.C.
MINISTER

F. A. MacDOUGALL
DEPUTY MINISTER


BIG CREEK
REGION

The Backus Mill built as a saw mill in 1798 was later converted to a grist mill. It escaped the ravages of the American forces in the war of 1812 and is the oldest mill in continuous operation in Ontario. It is still driven by water and remained in the same family for almost 160 years, until it was taken over by the Authority in 1956.

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compiled by

CONSERVATION AUTHORITIES BRANCH

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INTRODUCTION

With the advent of the new concept of personal and community responsibility in conservation, the Authorities movement was born, and the willingness of the people to undertake conservation work in this way is indicated by the fact that in the last 17 years 33 Conservation Authorities have been established, with a total membership of 468 municipalities and an area of 21,952 square miles.

The Big Creek Valley Conservation Authority was established by Order-in-Council on September 9, 1948, following an organization meeting at Delhi on June 25, 1948, when 9 municipal representatives out of a total of 11 attended the meeting and 8 voted in favour of establishing the Authority. Since then the Authority has been enlarged to include all the streams as far east as Nanticoke Creek and as far west as the east boundaries of the Upper Thames River and Otter Creek Conservation Authorities, and its name has been changed to The Big Creek Region Conservation Authority.

The Department of Lands and Forests, as a service to an Authority, undertakes to carry out a conservation survey of the valley for the guidance of the Authority, but the commencement of conservation work in the valley does not necessarily have to wait until such a survey has been made and the report presented. The Big Creek Region Conservation Authority has done much excellent work both before and since receiving the survey results. For example, the Authority has acquired 2,352 acres of land for an Authority Forest and has also acquired ten Conservation Areas, the best known of which are the Backus area and the Waterford ponds. Several dams have been rehabilitated and construction is now under way on the Lehman dam near Delhi.

The original Big Creek Conservation Report, issued in 1953, was confined to certain aspects of conservation on the Big Creek Watershed alone. The Big Creek Region Conservation Report, 1963, covered the subjects of History, Land, Forest, Water and Wildlife for the whole area under the jurisdiction of the Authority. A summary of this large volume, with revisions in some sections bringing them up to date, is presented herewith for distribution to the people of the watershed.

—A.S.L.B.

Big Creek Region Conservation Authority

Established September 9, 1948

Enlarged August 5, 1954

CHAIRMAN	J. GRANT SMITH
VICE-CHAIRMAN	J. CLARENCE KING
SECRETARY-TREASURER	MRS. M. RUTHERFORD
FIELD OFFICER	W. D. ADLAM

MEMBERS:

Burford Township	BRUCE HILL
Charlotteville Township	ERLE BILGER
Delhi Town	WILFRED SPICER
Houghton Township	J. W. MARSHALL
Middleton Township	*L. STILWELL
Norwich North Township	*J. GRANT SMITH
Norwich South Township	*THEODORE COOPER
Oxford East Township	CLARENCE SCHOOLEY
Port Dover Town	*PARKER M. LENEY
Port Rowan Village	*JOHN KRESTEL
Simcoe Town	*J. CLARENCE KING
Townsend Township	*CLAYTON HALL
Walpole Township	CLARENCE HARVEY
Walsingham North Township	RALPH LEIGHFIELD
Walsingham South Township	J. B. WOOLLEY
Waterford Town	WILTON E. HONEY
Windham Township	ELMER McCONNELL
Woodhouse Township	F. K. KENT
Ontario Government	R. J. SMITH
	E. W. PHILLIPS
	A. C. HUFFMAN

*Member of Executive Committee

CONSERVATION AUTHORITIES BRANCH

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Supervisor of Administration:

F. G. JACKSON, B.Sc.F., R.P.F.

Supervisor of Engineering:

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Hydraulic Engineering:

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Hydrometeorology:

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Land Use and Supervisor of Field Officers:

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Forestry:

P. M. R. HARVIE, B.Sc.F., R.P.F.

Wildlife and Recreation:

K. M. MAYALL, B.Sc.F., M.A., R.P.F.

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T. E. BARBER, B.S.A., M.S.A., P.Ag.
R. V. BRITTAIN, B.Sc.F., R.P.F.
J. A. CARRUTHERS, B.Sc.F.
M. CHUBB, B.Sc.F., R.P.F.
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Recommendations

Stated or Implied in This Report

LAND

1. That the future prospects of the Upper Black Creek area be considered primarily in terms of agriculture and steps be taken now to preserve and improve the base on which this type of economy will rest.

2. That those desirable changes in land use which demand the application of technical experience, a longer period of years to accomplish, or a greater outlay of funds than are at the disposal of the farmer, might become wholly or partly the Authority's responsibility.

3. That the Authority promote land use planning on farms.

4. That the Authority continue its interest in farm ponds.

5. That, because the regulation of permanent streams by structures is subject to statutory regulation, the matter be considered a legitimate concern of the Authority.

6. That the Authority assist, where desirable, in the construction of grassed waterways.

7. That sand dunes, which are usually unstable, be covered by trees and permanent grass.

8. That action be taken to control streambank gullies before they become a serious problem.

9. That some of the badly gullied and eroded steep slopes be reforested.

10. That the permanent woodlands be improved and the grazing of them restricted.

11. That the Authority publicize the services provided by various agencies which are available to farmers.

12. That the Authority publicize the advantages of adequately installed tile drainage.

13. That the Big Creek Region Authority Forest be expanded through a continued program of annual additions and planting until the total area of 12,741 acres is acquired and reforested.

14. That a policy of aiding landowners to reforest marginal land be established by the Authority; this to include furnishing a tree-planting machine with tractor and operator for a nominal sum and subsidizing hand planting on land too rough, too steep or too wet for machine planting.

15. That the Authority, under agreements with co-operators or through lease or purchase of suitable woodlots, undertake the development of woodlot improvement projects to demonstrate the advantages of better forestry practice.

16. That the Authority, by purchase of equipment, organization of cutting crews, or direct subsidy, encourage private owners in thinnings and improvement cuttings in their woodlots.

17. That the Authority investigate the Halton County fencing scheme and adopt such a modified scheme as seems most likely to result in elimination of woodland grazing.

18. That the Authority co-operate with schools, government departments and all other groups and agencies possible to publicize the need and the methods of reforestation and woodlot management; and in particular that the Authority sponsor tours, practical demonstrations and field days for this purpose.

19. That the Authority encourage and co-operate in research on the best methods of establishing and managing woodlands under local conditions.

20. That the Authority act as co-sponsor for:

    (a) 4-H Forestry Clubs

    (b) The Tree Farm movement

21. That the Authority assist in investigating and publicizing markets and marketing methods for woodlot products to encourage:

    (a) maximum use of low-grade materials from thinnings and improvement cuttings

    (b) closer and more uniform appraisal of timber, whether standing or in the log

(c) marking of trees for removal

(d) securing of competitive bids for timber

(e) insistence on a written Timber Sales Contract

22. That the Authority investigate and urge the implementation of the best method of providing fire protection for wooded areas within the watershed in co-operation with the Department of Lands and Forests.

23. That the Authority encourage the establishment of windbreaks and shelterbelts.

WATER

24. That the Big Creek Region Conservation Authority set up an Advisory Committee on Pollution Control.

25. That the Authority support the present work of the Ontario Water Resources Commission and the Department of Lands and Forests in pollution control by publicizing the present conditions and the need for co-operation by every individual and industrial company.

26. That the Authority establish ground water observation wells for the study of the North Creek water table fluctuations.

27. That the Authority encourage the dissemination of technical information on irrigation among the farmers concerned.

28. That the Authority assist in the proper location and construction of farm ponds.

29. That the Authority give early consideration to the construction of a dam on North Creek.

30. That the Authority investigate the construction of reservoirs as a conservation measure.

31. That the Authority purchase, as soon as possible, the necessary land required for the postponed construction of reservoirs, thereby avoiding the high land prices of the future.

32. That the Authority construct a series of community ponds throughout the watershed.

WILDLIFE

33. That landowners who are interested in improving the habitat for game be encouraged by the Authority to practise selective cutting of woodlots, to prevent cattle from grazing in woodlots, and to keep a few field boundary hedges planted with Rosa multiflora.

34. That farmers be encouraged to seed the edges of irrigation ponds and construct new ponds for wildlife, planting them with the species listed in the report.

35. That in view of the importance of fisheries to the towns in the watershed along Lake Erie, the Authority urge that every possible means be used to prevent lampreys from spawning in those creeks in the watershed found during the survey to be suitable spawning grounds.

36. That the Authority urge the Ontario Water Resources Commission to control the existing pollution of the Lynn River at Simcoe and Port Dover.

37. That the stocking and management of fish in the creeks of the watershed be based on the map "Biological Conditions of Streams" which accompanies the report.

38. That owners of streams suitable for fishing be encouraged to improve them by various structures referred to in the report and by planting trees and shrubs, of the kinds specified, along the banks, and where possible by fencing streams from cattle and providing rubble at cattle crossings.

39. That the Conservation Authority acquire a stretch of stream (part of Venison Creek is recommended) and supply a demonstration of stream improvement for fish.

HISTORY I

CHAPTER 1

THE INDIANS AND THE FRENCH

1. PRE-IROQUOIAN

The first inhabitants of the Big Creek area were primitive tribes of Algonkian stock, whose relics are found over most of Southern Ontario. At first in the nomadic hunting-and-gathering stage of culture, these peoples, before they quitted the area, may have learned something of primitive farming. This knowledge probably came from contact with other peoples to the southward. It was from the south also—from the valley of the Mississippi—that the more advanced culture of the Mound Builders entered the region north of Lake Erie.

The origin, distribution and date of this interesting culture have been the subject of lively dispute among archaeologists. In the past a number of imaginative theories were put forward concerning it. More careful investigation has led to the abandonment of some of these notions. It came to be held that the "Mound Builders" were not a mysterious race, emigrating in a body from some distant country and, after flourishing for some generations, disappearing without descendants. Rather it was thought that this culture was spread northwards by traders or small groups of emigrants, that these mixed with the previous inhabitants and that, in some areas south of the Great Lakes, there was no gap in descent between the peoples of historic times and the builders of the mounds.

Excavations carried out in the last two or three years have shown that this culture was widely distributed across Ontario and have established its connection with some of the characteristic earthworks. This makes it seem probable that certain earthworks in the Lake Erie region may be referred to this period, along with some sites called "Pre-Neutral" in the earlier archaeological reports. No earthwork is on record as surviving in the Big Creek even to the time of white settlement. There is, however, reason to think that these peoples used certain paths across the area from the Grand River to the earthwork in Southwold. None of the historic descriptions of the Iroquoian Indians mentions any use of earth ramparts in fortification and it seems more reasonable to attribute this enclosure to some earlier people. The Mound Builders were skilled in flint working; it is probable that they established the great trade route between the centres of this craft at Flint Point on Lake Huron and Point Abino on Lake Erie by way of the Ausable, Thames and Grand Rivers and used the other landings on Lake Erie with the paths leading to them.

2. THE NEUTRALS

When Samuel de Champlain, in 1615, first visited the Huron country on Georgian Bay, he was told of a nation whose nearest villages were a few days' journey to the southward. The Hurons called this people the "Attiwandarons" a name meaning "those whose speech is a little different". Champlain calls them "La Nation Neutre"—the Neutral Nation. Etienne Brulé was the first white man to visit the Neutrals and probably the first to see Lake Erie. He left no account of his journeys and it is not until ten years later, in 1626, that we have an eye-witness account of this nation when Father Joseph de la Roche Daillon, a Franciscan, obtained permission to attempt a mission to the Neutrals.

The Neutral Nation belonged, as their Huron name implies, to the Iroquoian language group. This included not only the Five Nations of the first Iroquois Confederacy, but also the Hurons, Petuns, Eries and Conestogas and other nations south of the Great Lakes. They were "peoples of the long house," using the round wigwam only as a temporary dwelling. They lived as a rule in palisaded villages and drew their subsistence as much from their cornfields and gardens as from the hunting and fishing which they also practised.

Brébeuf and Chaumonot were no more successful than Daillon in overcoming the suspicions and superstitions of the Neutrals; but they stayed rather longer in the area and travelled over much more of the Neutral territory. To reach one of the western villages they passed 18 towns and hamlets (*bourgs et bourgades*). They estimated that 10 of these contained altogether 3,000 souls and they were told that the Neutrals had 40 towns in all.

The palisaded villages of the Iroquoians were more difficult to construct than the clusters of lodges that formed the ordinary Indian settlement. They were much more permanent, but had eventually to be moved when the fields were exhausted or firewood grew scarce. The primitive farming, carried on with the digging stick or shell hoe, could not cope with the growth of weeds and grasses. Fields had often to be abandoned while still potentially fertile, and new ones made at a distance from the village. This was the reason for the temporary hamlets mentioned by Daillon. These and the open villages could be moved more often when sanitary conditions made a new site desirable.

There were, however, certain spots that were never wholly abandoned. These were occupied by each nation permanently settled in the area. Two of these seem to have been at Turkey Point and at the confluence of Black Creek with the Lynn River. The latter is now included within the built-up area of Port Dover.

The coming of the white men upset the economy of all the Indian nations. The fur trade sharpened the competition for hunting grounds and gave an advantage in war to those tribes in direct touch with the trading posts. The Neutrals were prevented from using the northern routes to Montreal by the Hurons. The southern routes to Montreal and Albany were barred by the Iroquois. The trade which had made them useful to their neighbours was being destroyed, while it remained difficult for them to obtain the new tools and weapons.

In 1649 the Iroquois finally felt strong enough to carry out their plan of gaining complete control of the whole trade in furs. They attacked and destroyed the Hurons and Petuns and in 1650 they wiped out the Neutrals.

3. THE RETURN OF THE FRENCH

The north shore of Lake Erie was now part of the beaver hunting grounds of the Iroquois. For more than 50 years it remained without permanent inhabitants. The Iroquois used the paths and camping grounds familiar to their Neutral captives. But they built no "castles" here as they did on the north shore of Lake Ontario. The Iroquois found it to their advantage to be on better terms with the French, who had attacked and burned villages in the heart of their old territory. Peace was made in 1667 and lasted for twenty years.

French traders and missionaries could now again venture to travel on the lower lakes, though to do so was still not without risk. In 1699, Louis Joliet was sent to find a copper mine on Lake Superior. With another trader named Peré he travelled to Lake Huron by way of the Rouge River and returned by Detroit and the north shore of Lake Erie. Their Indian guide was afraid to take them by

Niagara, so they landed and hid their canoe, it is believed, at Kettle Creek, certainly a long way west of Long Point. From this place they travelled overland to the Grand, possibly by the lakeshore, but more probably by the more direct inland trails. In either case they traversed a large part of the Big Creek area, but Joliet's map of 1674 shows little knowledge of the shoreline and represents Long Point as an enormous peninsula.

The Sulpician priests, Francis Dollier de Casson and René de Galinée, spent the winter of 1699 near the site of Port Dover where they built a log cabin as combined house and chapel and gathered a store of chestnuts, hickory-nuts, plums and grapes. Game was plentiful and the weather mild. In March, 1670, they planted a large cross with the arms of France and took possession of the country in the name of Louis XIV. Their journey along the shore was troublesome. They camped for a night at Turkey Point; found Joliet's canoe near Kettle Creek and after many adventures reached the Jesuit Mission at Sault Ste. Marie. From this time on travellers of both races passed frequently up and down this shore of Lake Erie. There are indications that in the eighteenth century the French were acquiring a little knowledge of the country from behind Long Point to the Grand River.

Until well after 1700 their maps add nothing to the information supplied by Galinée. His map showed two large creeks between the Grand and the Lynn River; the forking of that stream; and three streams flowing into the bay east of the portage. He notes the "prairies" around the portage and writes "terres excellentes" behind Turkey Point. Long Point is called "Presqu'ile du Lac Erié" and shown running nearly east and west almost to the mouth of the Grand.

4. THE MISSISSAUGAS

The movement of Algonkian peoples from the north had continued until by 1700 they were in possession of a good part of the Iroquois hunting grounds north of Lake Ontario. The tribe that occupied the lake shores from near the Ottawa to about Kettle Creek were the Mississaugas or "People of the River Mouth". Their original home had been Manitoulin Island and, possibly, the Bruce Peninsula.

The Mississaugas were still a semi-nomadic people, leaving their villages at certain seasons to hunt or fish in distant places. They had learned to farm like their Iroquoian neighbours and appear to have taken over the trails and village sites used by previous inhabitants. Fairly permanent villages are known to have existed on the site of Port Dover and at Turkey Point. Frederick Mabee, an early settler, was buried in "the Indian Cornfields" above Turkey Point in 1794.

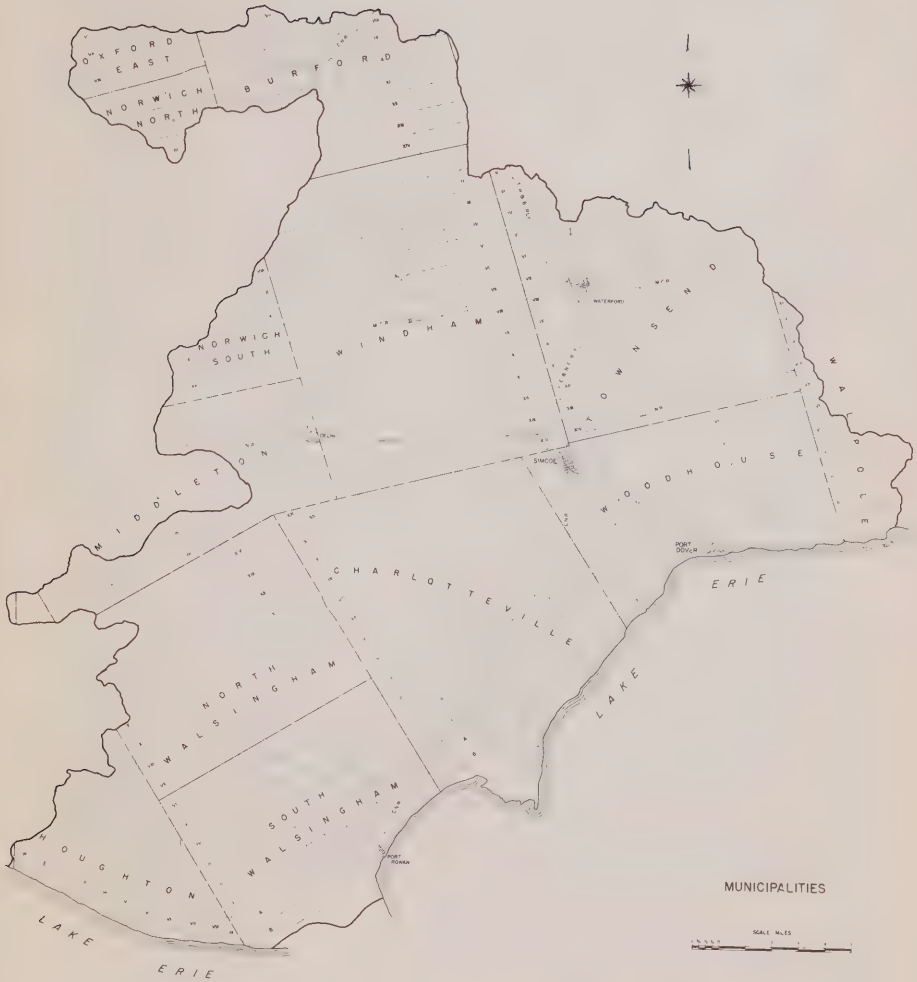
CHAPTER 2

UNDER BRITISH RULE: 1760-1788

1. THE FRENCH AND INDIAN WARS

On Lewis Evans' map of 1755 this note is written across the area north of the Thames:

> "The Confederates, July 19, 1701, at Albany, surrendered their *Beaver-Hunting* Country to the English, to be defended by them, for the said Confederates, their Heirs and Successors forever. And the same was confirmed Septr. 14, 1726; when the Sènecas, Caiugas and Onondágas surrendered their Habitations from *Cayahoga* to *Oswego,* and Sixty Miles inland, to the same, for the same use."


OXFORD EAST
NORWICH NORTH
BURFORD
NORWICH SOUTH
WINDHAM
TOWNSEND
WATERFORD
MIDDLETON
SIMCOE
WOODHOUSE
PORT DOVER
CHARLOTTEVILLE
NORTH WALSINGHAM
SOUTH WALSINGHAM
PORT ROWAN
HOUGHTON
LAKE ERIE
LAKE ERIE
MUNICIPALITIES
SCALE MILES

On the strength of these treaties the part of Ontario between the Trent and Detroit Rivers was a British protectorate. It was not until 1760 that this shadowy claim could be enforced.

During the earlier years of the wars, the British did not succeed in detaching the Mississaugas completely from the French alliance, but within their own territory they seem to have done little to render effective help. A few days after the destruction of Fort Rouillé at Toronto in 1759, Sir William Johnson made peace with a "Chippeway" chief, Tequakareigh, and urged him to bring the other tribes to trade at Niagara and Oswego.

Soon bands of Mississaugas were coming to trade, hunting for the garrisons and bringing prisoners captured earlier in the war. But it was always hard to make a binding treaty with these tribes.

2. THE BRITISH TRADERS

In the few years between 1760 and Pontiac's War, traders had been free to operate in the area formerly controlled by the French. The British authorities, aware of the uncertain temper of the Indians, attempted to control this traffic by a system of passes which usually prohibited the sale of rum and other spirits. The traders, however, used "very unfair means of getting up that pernicious liquor even by altering passes". It is chiefly from records of arrests and seizure of spirits that it is known that certain traders from Detroit, Schenectady or Montreal were trading at different points up and down the lakes.

After 1770 traders were licensed to trade in particular areas, usually at certain rivers. It now became legal to winter away from the forts. The best known of the traders who frequented the north shore of Lake Erie was David Ramsay, a Scotsman who came from Schenectady by way of Niagara with a bateau-load of goods and, with his young brother, built a log cabin some distance up Kettle Creek.

3. INDIAN TREATIES

As early as 1764 the Mississaugas had ceded to the British Crown a narrow strip on both sides of the Niagara River. Twenty years later, after the Revolutionary War, a much larger cession was made.

These surrenders of their sovereignty over the area did not mean that the Mississaugas ceased to use it as they had done. They were still living there when the first settlers arrived and continued to do so for some years longer. Their numbers were reduced by epidemics in the 1790's and, as settlement increased, they gradually withdrew. Some went to the Grand River, where they already had villages among those of their friends of the Six Nations; others to their more remote territories to the north and west. No reserves were set up for them near this part of Lake Erie, and eventually they became as much a memory as the Neutrals.

CHAPTER 3

SETTLEMENT: 1789-1795

1. THE DISTRICT LAND BOARDS AND IRREGULAR SETTLEMENT: 1789-1794

The Quebec Act of 1774 had extended the Province of Quebec westward to the line of the Mississippi. What administration was needed in the vast, uninhabited western part of the province was chiefly the responsibility of the Commanding

Officers of the forts. When Loyalist settlers began to move into those regions after 1783, these officers were charged with the business of placing them on their locations. After five years of rather rapid settlement, a proclamation of July 24, 1788, divided what is now Ontario into four Districts. The third district, Nassau, was to extend from the mouth of the River Trent to

> ". . . . a north and south line, intersecting the extreme projection of Long Point into Lake Erie on the northerly side of the said Lake Erie."

The Land Board of Nassau, assuming that their District extended to the *landward* extremity of Long Point, was by 1790 giving settlers a qualified permission to locate there without waiting until surveys could be made.

(a) *Walsingham Township*

Asa Holmes, John and Christian Troyer, and Timothy Murphy can all be placed in this township by 1791. There were probably other settlers and it is impossible to say who was the first arrival. John Troyer was a pious, hardworking and ingenious man, a capable farmer, gardener and planter of fruit trees. He built the first grist mill in Walsingham Township and probably the first boat and wharf. By 1812 he had lived longer in the township than anyone else and could claim to be the earliest settler.

(b) *Charlotteville*

There were probably five settlers in Charlotteville Township by the end of 1792. Two of these, Silas Secord and John Stacey, claimed to have been "encouraged" by the Nassau Land Board, and especially by Major Gilbert Tice of the Indian Department, who became a member in 1791 and had died before November, 1792. The others had to depend on a petition presented some months after their arrival.

In April, 1793, John Stacey, Tunis Crunk, Conrod Cope, Jacob Darby and two others petitioned to have their lands surveyed "with all convenient speed". Silas Secord may well have been one of the two unnamed petitioners and the other may have been a man named Warner, who seems to have lived long enough on Lot 7 to give his name for a time to the creek that flowed through it. Conrod Cope had evidently been improving for William Cope on the last lot in Walsingham; while Tunis Cronk, William Cope's son-in-law, had occupied Lot 1 in Charlotteville to the east of the townline and of Cope's Brook. Jacob Darby does not appear to have remained in Charlotteville. Later in 1793 two large parties arrived, both with Simcoe's permission to settle in the Long Point area, totalling between 20 and 25 persons over 16 years of age.

One of these groups was led by Frederick Mabee, who had served with the British in the Revolutionary War and on discharge had gone to Nova Scotia.

The Mabees are reported to have travelled overland from Niagara to Turkey Point on horseback with an Indian guide, driving with them twelve cows and living chiefly on milk and cornmeal. The party included Frederick and Lavinia Mabee, their eight children, two sons-in-law, Peter Teeple and John Stone, their cousin Peter Secord and his son David and possibly other relatives. The need for fodder for their cattle led the Mabees to build a "good Cabbin" and make a small clearing on a strip of flat below the bluff near the north-eastern beginning of Turkey Point. Here a path led down the bluff to a boat landing and was crossed by another leading along the beach from the east and out onto Turkey Point with its natural meadows. "Mabee's Old House" stood close to the intersection of these trails, on

a site now covered by the waters of Lake Erie. The Stones and the Secords seem to have made separate improvements, while Oliver Mabee, the eldest son, soon joined his father-in-law, Abraham Smith, in the inland settlement near the site of Vittoria.

Most other settlers in Charlotteville before May, 1794, were evidently squatters who made no attempt to justify their settlement and moved on to other locations. It is impossible to estimate how many of these there may have been, but it seems probable that the township was about as populous as Walsingham at the time of Simcoe's visit.

(c) *Woodhouse Township*

Woodhouse Township had proved less attractive to settlers. A man named Patterson was believed to be squatting at the mouth of the Lynn River in May, 1794, and to have been there for at least a year. Peter Walker, a settler authorized by Simcoe to settle "at Long Point", probably moved to the site of Port Dover before the end of 1793. He is said to have been the only settler when the Austin family arrived in the spring of 1794.

2. THE ASSOCIATED COMPANIES: 1793-1797
BURFORD, TOWNSEND AND WINDHAM TOWNSHIPS

When the real settlement of Upper Canada began in 1783 the pressing problems were to provide for the large number of displaced refugees and to place them so that their settlements would support and be protected by the principal military posts. In the case of the Long Point Settlement, the surveys were delayed by Simcoe's military plans for the area.

The attempt to settle the northern townships of this area began in 1793 and a very small amount of actual settlement took place in Townsend by the end of 1794. The main movement of settlers into Townsend and Windham ran parallel to the second phase of settlement "at Long Point", but until 1796 it was carried on under a special system that was applied only partially and sporadically to Simcoe's military colony. It was only after settlement was well advanced and local government began to be organized that most of the settlers in Townsend and Windham were drawn into the orbit of Charlotteville and Woodhouse rather than that of Burford and Oxford.

The system used in these townships is usually called "Settlement by Associated Companies". A less misleading name would be "Settlement by Reserved Townships".

(a) *Dayton's Township (Burford)*

Simcoe had hardly reached Niagara in 1792 before he received a number of petitions from groups of associates asking for grants of one or more townships. Abraham Dayton, who obtained the right to bring settlers into Burford Township, had brought enough families into the northern part to prevent forfeiture in 1796. There is little evidence of settlement in the southern half before 1804, and not much before 1812.

(b) *Townsend Township*

This township was granted to Andrew Pierce and his associates in March, 1793. It was thrown open to ordinary settlement in 1798. Pierce had probably

fulfilled his undertaking to bring in 50 settlers by 1797; but it had been decided to end the system. It had become unpopular with the Council and other prominent settlers because it prevented them from locating additional grants in many desirable townships without the need to find a "new settler" to "cover" the lots by occupation. The Council refused to allow any associate more than 1,200 acres or to allow any refund of money expended, except on surveys. For more than a generation new settlers preferred to buy or lease lands in the settled part of the township west of the line between Lots 12 and 13.

(c) *Windham Township*

Windham Township having been forfeited by Pierce and his associates in May, 1796, there was immediately a rush by privileged claimants to take up land in the township. In a few months several thousand acres had been granted. Some of these grants were patented almost at once; by the end of 1798 about 34,000 acres had been patented in Windham. Most of these grants were for more than 600 acres each. The great majority of these grantees remained absentee owners until after 1820. Three-quarters of the township was quite unimproved and the roads still ran through long stretches of woods in the early forties, when settlement had begun to spread into the centre of the township.

3. THE MILITARY SETTLEMENT

(a) *The First Proposals*

Plans for a military settlement on Lake Erie had been in Colonel Simcoe's mind at least as soon as his first days in Quebec. On December 1, 1791, less than a month after his arrival, he wrote to Commodore Grant at Detroit asking for soundings of the harbours and bays and naming Long Point in particular.

The opinion of Long Point expressed by William Chewett, Senior Surveyor, in his report was that the eastern extremity of the point itself was too low, sandy and marshy for settlement or fortifications; and that the anchorage near it was poor and exposed to most winds. However, the inner harbour was good and the mainland excellent for settlement.

This report was most satisfactory to Simcoe; it confirmed his intention to fortify the harbour, but diverted his interest from Long Point to Turkey Point.

(b) *The Squatters*

In the meantime it became necessary to deal with the squatters throughout the province and especially at Long Point. Order for this was given in Council on May 24, 1794. This notice to quit must have caused some consternation among the inhabitants of Long Point, but it can hardly have come as a surprise. Since Chewett's visit 11 months before, they had known that they were likely to be called to account.

The settlers who had acted for themselves were probably given favourable treatment. The few who could do so produced certificates to show who had "encouraged" them to settle, others had to depend on the Governor's verbal promises, or be content to stress their own or their parents' services and sufferings during the war, their present loyalty and their willingness "at all times to serve the King". Evidently they were well aware of what the Governor required from settlers in a military area.

CHAPTER 4

THE LONG POINT SETTLEMENT: 1795-1812

1. THE GOVERNOR'S TOUR, SEPTEMBER, 1795

Lieutenant-Governor Simcoe held an important council with Indian chiefs at Fort Erie on August 28 and 29, 1795. The next day he set out for Long Point, travelling by land and much faster than was his wont on such journeys of inspection. He was back at Navy Hall by September 12. During those 14 days he followed the shore of Lake Erie as far as Turkey Point, and possibly to Big Creek; struck inland to the site of Simcoe (where he is said to have camped); crossed Townsend to an Indian village on the Grand River and then came down the Grand.

The stages of Simcoe's journey seem to have been "Omstead's" in Rainham, Gilmore's in Walpole, Peter Walker's and Samuel Ryerse's in Woodhouse and the Widow Mabee's at Turkey Point. At Turkey Point he approved the sites selected for town and barracks, shipyard and wharves on the point and a mill on a creek to the east. Simcoe noted the cliffs "150 feet high" and behind them the "High White Oak Plains extending to the River Thames". The whole of the Point was to be a naval reserve and a large area on the heights to be reserved for the town and military installations.

2. THE COMPLETION OF THE SURVEYS

The results of the promises made during Simcoe's trip were embodied in a long report from the Acting Surveyor-General. Smith worked this out in the week following their return and forwarded it to Simcoe on September 21, 1795. Petitions had been arriving right up to their departure for Fort Erie, among them one from John Backhouse, asking to locate his 600 acres "on Long Point". This was granted without any definite location.

Instructions were issued first to complete the surveys of Woodhouse, Walpole and Rainham; then Walsingham and Charlotteville. Due to bad weather and shortage of provisions Charlotteville and Walsingham were not completed until early in 1797, Walpole in November of that year and Woodhouse in February, 1798.

3. EXPANDING SETTLEMENT — 1795-1812

The demand for locations continued unabated and if the authorities had been willing to accept any ordinary applicant the area would have been taken up even sooner than it was. If actual settlement had been insisted on as rigidly as the qualifications for a grant, the settlement would have been more populous and compact. As it was this was considerably hindered before Simcoe's departure by permitting settlers to take their additional lands in the concessions near the lake and prevented by Russell's allowing absentees to do so in 1797. Russell did, however, continue the policy of selective settlement, and loyalty, proved if possible by military service, remained a prime requisite until after 1800. Many petitions for land in the area are endorsed "Anywhere but at Long Point".

By 1797 it was beginning to be hard to find grantable lots, chiefly because of these additional grants of military and family lands in the five Long Point townships.

(a) *Walsingham Township*

The population of Walsingham grew slowly for many years and the settlement was for long confined chiefly to the south-east corner. Daniel Hazen, when

Interior of Backus Mill, showing millstones — much of the machinery has been renewed at different dates in the past hundred years.

The Ryerse graves in the churchyard at Port Ryerse. The short, dark stone in the centre background marks the grave of Samuel Ryerse, died 1812. Beyond his wife's grave to the right, is a boulder with a tablet commemorating Samuel Ryerse and his brother Joseph Ryerson, with other pioneers of the Long Point settlement.

Gravestones in the cemetery at the "Hazen Settlement" near Walsingham Centre. Almost the only relic of this settlement, begun by Daniel Hazen in 1798, this cemetery contains stones with dates from 1849-1904, but chiefly from the 1850's, when the village was flourishing.

he decided to settle near the centre of the 5th concession in 1797, was, by his own account, five miles beyond the edge of settlement and even in 1815 was still four miles from a public road. Some settlers might have followed Hazen's example if they had been able to get Crown grants, though it is not likely that there would have been a keen demand for land in the pine woods of Walsingham while locations were available on the plains.

(b) *Charlotteville Township*

Enough settlers were able to find farms in Charlotteville Township to form a reasonably numerous and compact settlement, confined, however, to the eastern part of the township, except in the first three ranges. This was the core of the Long Point Settlement and it was not long before Charlotteville was the most populous township in Norfolk County. Seventy-five persons were assessed in 1801, indicating a population of more than 450 souls. Here, as in Walsingham, there were more than the usual number of settlers without taxable property. Welch's 1798 plan of the town and naval reserves at Turkey Point has a note that the south-east shore of the point was a "valuable fishery occupied by Squatters" and these were probably not the only ones in the township. An estimate of between 600 and 700 souls living in Charlotteville Township in 1812 may easily be short of the mark.

(c) *Woodhouse Township*

There is a "Census of Woodhouse, 1812" in the Ontario Archives but it is far from being complete. A list of householders known to have been living in Woodhouse in 1812, whose names are omitted from this "Census", can easily be brought up to 20 names or more. The total population was probably well over 500 in 1812.

(d) *Walpole, Houghton and Middleton*

The survey of Walpole was completed in 1798 just at the time the granting of additional lands was nearing its peak. But large grants to individuals were also made in 1795, as a result of petitions presented during Simcoe's trip to Long Point. A great part of the section of the township drained by Nanticoke Creek was taken up by a grant of 2,000 acres to Lieutenant David Sutherland.

Norwich, Middleton and Houghton had been among the townships reserved to provide funds for schools. Norwich was sold with Dereham to provide for the cost of opening Dundas Street east of York in 1799. These townships were bought in large tracts by speculators and there was no settlement in Norwich until William Willocks sold his tract to the Quakers of the Lossing settlement who arrived in the township in the summer of 1811.

The only land known to have been granted in Houghton before the laying out of the Talbot Road in 1808 was a tract of 200 acres ordered for David Price of the Indian Department in February, 1798. Malahide and Bayham were formed out of the western part of Houghton. The remaining fragment, which forms the present township, was not fully laid out in lots until 1819.

Middleton was partly surveyed at the time of the laying out of the Talbot Road in 1809-11. The inhabitants of the township in 1817 told Robert Gourlay that it had begun settling two years before.

Although large sections in every township remained unoccupied, Simcoe's military settlement had made good progress by 1811 and from a military point of view had gone far to realize his purpose in founding it.

CHAPTER 5

THE WAR OF 1812-1814

1. THE OUTBREAK OF WAR, JUNE 18, 1812

That war with the United States was probable, was evident to some people in Upper Canada before the end of 1811. Apart from the growing clamour for war across the border, it was plain that the Canadian authorities were doing what they could to prepare for attack. Reorganization of the Norfolk militia into two regiments was a minor step in this program.

2. THE EXPEDITION TO DETROIT

The indifferent attitude of the Norfolk Militia, whom he had considered the most reliable in the province, was a bitter disappointment to Brock. Had the American general, Hull, moved energetically on the Thames, the situation of Upper Canada would have been highly precarious. Fortunately, he dallied at Sandwich, giving further time to organize the defence.

Brock's enthusiasm and the example of the other counties overcame any reluctance to volunteer for service, and a force including the Norfolk and Oxford detachments soon joined the regulars at Amherstburg. The brief attack on Detroit by these 1,330 men ended in the surrender of 2,500, the fort and all its cannon, an armed vessel and the whole Territory of Michigan.

By late 1813, however, the establishment of American naval superiority on Lake Erie had made the position of the Canadian commander, Procter, untenable. He withdrew up the Thames, closely pursued by General William Henry Harrison with a superior force. The retreat ended with the defeat at Moraviantown and the destruction of most of the military strength of the Right Division.

3. RENEGADES AND VOLUNTEERS

Harrison's force was ordered to Niagara, where 1,500 of his men were attached to the army under General McClure, while Harrison took 500 men to reinforce Wilkinson's ill-fated attempt on Montreal. What the inhabitants of the Lake Erie country had now to fear was raids by small bands of renegades, stiffened by detachments of enemy militia from Buffalo.

4. INVASION AND DESTRUCTION

(a) *Campbell's Raid, May, 1814*

In the spring of 1814 the Americans appear to have started rumours that they intended to invade Canada by way of Long Point. This possibility had been considered more than once, but so far no body of regular troops had attacked the area. It was some months before any attack took place and, when it came, it proved to be only a large-scale raid and not an attempt to take Burlington Heights from the rear.

(b) *McArthur's Raid, October 22 to November 17, 1814*

Summing up the achievements of his men, McArthur says that they "destroyed two hundred stands of arms, together with five of their most valuable mills. . . ." It seems improbable that McArthur would understate his record in this respect, for the mills were legitimate objects of attack.

The inhabitants told a different story, which they later repeated under oath. All along the line of march houses had been ransacked.

5. FORT NORFOLK

Prior to 1815 there had been a proposal to re-establish the naval station at Turkey Point and build an armed vessel there. Shortage of naval stores and the devastation by McArthur caused this plan to be postponed; but the army proceeded with the erection of works to protect the landing and possibly some housing for troops and stores. "Fort Norfolk" is shown on a sketch plan dated 1815.

As late as 1852 a large military reserve was retained at Turkey Point but Fort Norfolk had mouldered quietly away. There appears to be no trace of the fortifications at Turkey Point, but a monument near the site records the existence of this virgin fortress and some of the exploits of the men of Norfolk during the war of 1812-14.

CHAPTER 6

SOME ASPECTS OF LIFE IN THE AREA: 1795-1850

1. THE CHARACTER OF THE AREA

Accounts of Upper Canada published before 1850 rarely mention the Long Point country without dwelling on the abundance of "oak plains" as its most striking characteristic. The area, in fact, possessed most of the features considered desirable at this period. Some of these could be found in greater degree in other parts of the province opened to settlement before 1800; but hardly anywhere else were they combined with the special advantages of natural hay meadows, plains interspersed with woodland and adjacent sheltered anchorages accessible to vessels of some draught. The milder climate of the Lake Erie Region was an added attraction.

The combined advantages of the area explain why settlers were eager to go there before it was opened or surveyed and while long stretches of wilderness still separated it from the nearest settlements.

2. FARMING

(a) *Crops*

At first almost everyone farmed to some extent, whatever other occupation he might engage in besides. Even when some people had ceased to grow their own food, they were still vitally concerned with agriculture. Except for lumbering, the first industries were the processing of the products of the farms, and those employed in them were likely to turn out to help with haying and harvest.

The labour of chopping and burning the first clearing was normally repeated each season for several years until at least 20 to 30 acres had been cleared. This acreage was said to suffice to support a family, but some farmers cleared a good deal more. Seeding down with wheat allowed the roots to rot, allowing the land to be ploughed between the stumps. It eventually provided pasture and meadow, but pasture was always a difficulty on timbered land during the first few years, whereas on the plains the farmer had pasture from the first.

Twenty-five bushels of wheat per acre was considered a pretty good yield at this period.

Wheat, as everywhere in Upper Canada, was the most important crop, the only one that could always be exchanged for cash or goods. During the first years of occupation, the farmer on the plains could grow more wheat because each wheat piece was immediately available for other crops; whereas, on timbered land, the

rank growth of weeds could not be ploughed under and some new land had to be appropriated to oats or flax. The farmers near Long Point had a surplus of wheat in 1797. From that time survey parties often bought provisions locally and some grain could be disposed of to new settlers, but most of the wheat received by millers or traders was converted into flour or whisky and exported.

The production of barley in Walpole in 1881 was the largest recorded in any census—171,547 bushels, but in Norfolk County, except in Woodhouse where production had never been large, the figures in 1881 are well below those of the previous census. Wheat production was higher than ever; but in most townships of the area more oats and corn were now being grown than wheat and barley. The great days of the Ontario wheat trade were definitely over by the 1880's. The prairie provinces were coming into fuller production and buyers now preferred western wheat. Mixed farming was becoming the rule; and even the census of 1901, which shows record figures for some crops in Norfolk County, gives higher totals of oats and corn than for wheat, and much higher for all three than for barley, though this also seems to have been a record crop.

(b) *Stock and Pasture*

One of the things likely to attract a settler to Long Point was the possibility of keeping more than the average quantity of stock, especially cattle. In one of his despatches of 1794, Colonel Simcoe includes the settlers at Long Point among those in Upper Canada who were carrying on a trade in "Peltries" smuggled to the United States in exchange for goods and cattle. Simcoe probably exaggerated the extent of this trade and the number of cattle at Long Point in 1794 was probably small but it is probable that the number of cows in the settlement was already above the provincial average by 1800.

Conditions for stock-keeping were particularly favourable. Cattle ranged at large before 1870, and in the pioneer period they are said to have been left unhoused in winter. The farmers had no barns in 1797 and probably few had even the small log stables normally built as soon as possible in other parts of Upper Canada. After 1800, barns began to be usual and were probably the rule by 1812. Most of them probably contained stables for horses, milch cows and draught oxen; but young stock would need less shelter. The stock did well on the natural pasture of the plains and winter feed was plentiful in the natural hay meadows and the marshes.

Even in timbered areas, "meadows" are recorded in the first surveys. Some of these, like the "hay meadows" shown on the plan of Middleton in 1825, were probably old beaver ponds. Others seem to have been found on the flats along creeks. The meadows on Hay Creek in Woodhouse were sufficiently important to arouse the interest of the Government and steps were taken to keep them open for all the settlers for a short time after settlement.

Still more important were the blue-joint grasses of the marshes in Long Point Bay. These provided a very large quantity of hay with no trouble but the making and carting. At first settlers took their hay wherever they chose; those in Charlotteville and the adjacent parts of Woodhouse on Turkey Point, the settlers in Walsingham on Long Point.

It is evident that in 1810-17 a number of farmers in this area were producing butter and cheese for sale, while a few could be classed as dairy farmers. John Backhouse was an expert dairyman when he came to Canada.

Pioneer flocks of sheep were limited by the depredations of wolves and bears. They had to be kept in special fenced pastures around the buildings and often were

folded at night. This was never a great sheep-farming area and after 1900 sheep had little importance even as a sideline.

(c) *Fruit*

The fact that certain fruits would ripen out of doors along the shore of Lake Erie was an advantage shared by no other region in Ontario except the Niagara Peninsula, but only apples could stand long and slow journeys or frequent transshipment, and apples could be grown as well or better in other parts of the province.

Canning and evaporating plants seem to have made their appearance in Norfolk County in the 1890's. In 1901 there were three canneries in the county and two evaporating plants.

3. ASPECTS OF DAILY LIFE

During the 1820's and 1830's conditions of life were naturally altering for the better. But the change in that period was far less radical than in the 20 years after 1837. It was not only that the townships were filling up, business of all kinds expanding, villages multiplying and growing larger and communications improving rapidly; the industrial revolution had overtaken Upper Canada, and was to advance more rapidly every year. More and more processes that had been carried on by hand were being mechanized; workshops were being converted into factories and even farming was affected by these changes. Much of this early industrialism now seems primitive and small in scale, but it was gradually affecting every aspect of daily life. To us the change from open hearths to stoves, from candles to coal-oil lamps, from a jolting wagon to a well-sprung carriage, does not seem very great, but to the people of the time these were great strides forward. The old, self-sufficient life of the household was passing. Some of its features might subsist until the end of the century and beyond, but a new way of life had already begun.

4. LOCAL GOVERNMENT

An act of 1793 legalized the "Town Meetings", which settlers in the older settlements insisted on holding. These meetings were empowered to elect township officials—a warden, clerk, assessor, collector, constable, pathmasters and fence-viewers—but beyond this their only function was to determine what stock should run at large and what should constitute a legal fence. The elected officials were responsible to Quarter Sessions, who appointed them if no election was held and controlled all monies derived from rates, taxes and fines. These were paid in to the District Treasurer and disbursed by order of the court.

The rapid settlement of the western part of the District of London after 1819 started a movement to have the District seat moved to a more convenient location than Vittoria. There was, however, considerable difference of opinion as to where this was to be found. Evidence given by a number of prominent men before a select committee of the Legislative Assembly on December 22, 1825, showed that some favoured the rising village of St. Thomas, others a new town to be laid out on the Thames, either on Simcoe's reserve for "London" or his reserve for "Dorchester". Still others thought the District should be divided and the District Town for the eastern part remain at Vittoria or be moved to Simcoe. Others, including John Rolph, M.L.A., and Judge Mitchell, agreed with Duncan McCall, M.L.A., "leave the District as it is".

The committee reported against Vittoria. London was laid out and a temporary courthouse built there in 1826. This removal greatly lessened the influence

A house in Port Dover, of Loyalist type but probably built after 1820. Lean-to kitchens are usual in this area.

The Joseph Ryerson house, Lot 23, Con. 11, Charlotteville Township. The small paned window sashes were removed in Victorian times. More recent alterations have removed a porch, hiding a doorway in the style of 1815-25. Egerton Ryerson was born in an older house, but he may have lived for a few years in this one before 1825.

This house at Dover Mills, was probably built by Andrew Thomson when he bought the mills in 1847. It may include part of one built about 1820 to replace the one burned in the raid of May, 1814.

of the Norfolk magistrates in District affairs, especially as more and more Justices were appointed in Middlesex and Oxford.

5. SCHOOLS BEFORE 1855

When the Long Point area was first being settled in 1790-95, elementary schools supported by public funds were almost unknown outside the New England Colonies, where they had existed for about a century.

(a) *Elementary Schools*

Governor Simcoe was anxious to see grammar schools and a university established in Upper Canada. He intended these, however, to provide education for a governing class and expressed the opinion that, for the time being, the education needed for the children of ordinary settlers might be left to the provision of their parents.

Though the settlers were not used to the idea of free schools, it had been usual for parents to join in engaging a teacher and provide him with a house or schoolhouse, board or rations, firewood and a guaranteed minimum salary in cash or in kind, made up by assessing the associates if the small fees charged were insufficient.

Teachers at this period were often neither well educated nor of good character. They were often very young, and the drunken and disabled pensioner is not mentioned in connection with this area so frequently as in other parts of the province. A good many teachers came from the United States and the war probably disrupted education in these townships.

The Common Schools Act of 1846 based on a report by Egerton Ryerson did not go the whole way in adopting Ryerson's suggestions; but it provided for school taxes on assessed property, made some provision for free schooling where parents could not pay fees, increased provincial grants for education, made some improvement in teachers' salaries and attempted to improve the efficiency of District School Boards and Superintendents. More rigid inspection was to improve the standard of teaching and buildings and better training schools for teachers were to be established. Some improvements were made by an Act passed in 1847, and another in 1850 adjusted the system to the new form of municipal government set up by The Baldwin Municipal Act of 1849. These three school Acts are regarded as having laid the foundations of the public school system of Ontario but the structure erected on these foundations took more than 20 years to complete and has, of course, needed additions and alterations.

(b) *The District Grammar School*

The townships to the west and north of Walsingham had been reserved in 1798 to provide funds to set up at least one grammar school in each District of Upper Canada. There was no revenue from these lands before 1805 and very little until after 1812. It was not till 1807 that an Act was passed to allow the salary of one master of a grammar school in each District to be paid out of the general revenue of the province.

Seven trustees were appointed for the London District, five of them from the Long Point Settlement. The school should properly have been at "Charlotteville", but this was not insisted upon by the authorities at York.

The formation of the Talbot District in 1837 might have been expected to lead to the establishment of a grammar school at the District Town. There seems to have been some delay in doing this for, while a grammar school existed at

Port Dover by 1845, descriptions of Simcoe do not mention one before 1850. By this time the grammar schools were not limited to one to each District or County. They were still not fully integrated with the school system of the province. As Chief Superintendent of Schools, Egerton Ryerson was endeavouring to bring this about through the '50's and early '60's. He did not succeed in doing so until 1865. The School Improvement Act of 1871 did away with grammar schools and substituted high schools and collegiate institutes.

6. THE FORGES

The smelting of iron in this area falls entirely within the period covered by this chapter and may be treated here rather than with the more enduring industries of the area. It is of great interest and was of considerable importance to the development of the area, but the industry flourished for only about 25 years, from 1823 to 1848, though its beginnings go back to 1815. Deposits of bog iron in Norfolk County are said to have been observed as early as 1810.

Charcoal was mixed with the ore in the top house and dumped into the furnace with barrows. The melted ore ran down into a hearth about two feet by five feet and was ladled directly into moulds after skimming off the slag. At this period no flux was used. It was thought that the soil brought in with the ore made this less necessary, but it was believed that these impurities caused a good deal of loss of metal. According to one statement it took 213 bushels of charcoal for each ton of iron produced. Twenty-five cords of hardwood produced 1,000 bushels of charcoal, worth 50 dollars. Cutting wood for the forge was a profitable sideline for farmers. Another was drawing ore. In 1846, when the furnace was working 10 months of the year and producing about four tons of iron per day, $2.25 to $2.50 a ton was paid for ore at the furnace. The price in the 1830's may have been $2.50 to $3.00 per ton.

CHAPTER 7

TRANSPORTATION

1. ROADS

Various "roads" within the Big Creek Region are mentioned in records of 1791-97. Probably they were based, in part at least, on trails used by Indians—"footpaths" as they are often called in this period. It is evident, however, that by 1795 the use of these footpaths by settlers had made them passable for horsemen and sleighs and, in some parts, for wagons. The term "road" is then not a misnomer, though these roads were rough enough and had not yet been established and "made" officially. Improvement of the paths had been a gradual process, beginning with some widening and removal of obstacles, such as windfalls, which the Indians were content to go around. The work would be carried out by settlers taking cattle and horses along the path. Very little more would be needed to let sleighs pass and not a great deal to make it just possible to drive a loaded wagon.

(a) *Roads from the Grand River, 1791*

(1) The Road from Brant's Ford

Evidently this road branched off from the "Detroit Path" after the ford over the Grand. Its course must have been very close to that of Highway No. 24 until the latter enters Mount Pleasant; beyond that point the early road must have trended more to the south-west.

From the Indian Line the road ran to Nanticoke Creek, which it crossed at the site of Waterford. The crossing on Patterson's Creek was within the present

limits of Simcoe, but not necessarily exactly at the present highway bridge, though it cannot have been very far from it. The line of the present highway is the result of a series of adjustments which began very early and have continued almost to the present time. The early road existed before any surveys and will have followed the most convenient line.

Soon after the crossing of the creek near Culver's Mills in Woodhouse the old road must have forked, one or more trails leading off to the right or south-west to Turkey Point and so by the shore road to Long Point. One of these trails seems to have passed close to the site of Vittoria but there may have been alternative routes across the plains.

All three roads from Culver's to Lake Erie—to Ryerse's, to Dover and to Turkey Point—might be regarded as branches of this road from the Grand; but in 1814 it was already referred to as "the road to Dover".

(2) The Road from the Grand River at Nelles's

Augustus Jones notes this road in 1791 as crossing the Indian Line approximately at Concession VIII of Walpole Township near Little Buffalo. He calls it "road from Barefoot to Long Point". Barefoot was evidently chief of the Mississaugas, whose village Jones notes on his traverse of the Grand River as about two miles above "Major Nelles's house" and on the opposite, or right, bank of the river. The Nelles family had two trading houses on the Grand near the site of York, and from them "Nelles's Road" led to the family homesteads on the Forty-Mile Creek in Grimsby Township. It was this road to the "Forty", rather than the "path from Barefoot's Village" (also noted by Jones on the north-east boundary of the Indian Lands), that was the continuation of this road to Long Point. Simcoe was to use the road from the Forty to the Grand in 1793 on his journey to Detroit, going up the Grand River on the ice from Nelles's to the Mohawk Village.

(b) *The Front or Shore Road*

This may well have been the first road of access to this area and seems to be the first referred to as "the King's Highway" in an official document.

It was along this road that Governor Simcoe's party rode from Fort Erie in 1795 and along it many of the settlers had driven cattle and horses, while others of their party conveyed the heavy goods in bateaux. When Simcoe traversed it the road was probably already passable for sleighs.

A fine map engraved in England in October, 1813, shows this highway from Fort Erie running along the shore till it crosses the Lynn River and then turning inland up the road to the Grand until it joins the Talbot Road.

The road in front of the Second Concession of Woodhouse does not seem to have been open before 1840 and it was only in 1845 that the District Council authorized a road up the Walpole Line to the Second Concession of that township. Two years later the Front Road from Port Dover to Walpole was re-established farther from the shore and later this was done in Walpole and Rainham. The use of the road for through traffic declined after 1840 and it was kept up chiefly to accommodate the owners of shore properties.

(c) *The Talbot Roads—1804-10*

(1) The "Bostwick" Road

The Legislature of Upper Canada in February, 1804, passed a grant for improving public roads in the province and assigned £250 to be spent on a high-

way across the District to connect with the travelled road down the Thames to Sandwich.

After the land from Windham to Southwold was surveyed in 1809-10 settlement began to spread eastward along the Talbot Road from Dunwich, traffic between Long Point and Port Talbot increased and the road was evidently improved, though as late as 1811 the Legislature voted money only for the route by the Thames. Because settlement on the Talbot Road in Middleton and the present Township of Houghton lagged until after the war, the road opened in 1806 was preferred to the one surveyed in 1810.

(2) Talbot Street, 1809

Talbot's proposal for a settlement road having been approved, Mahlon Burwell was instructed in the spring of 1809 to survey the road under Talbot's superintendence.

It was one thing to lay out a settlement road, but quite another to maintain it as a passable highway. A road was evidently opened through to Delaware and this must have involved expenditure of provincial funds. Such a road appears on the map of 1813. It seems to follow the Talbot Road from Port Talbot to Otter Creek and the Windham-Charlotteville Line from Middleton to Townsend, but the scale is too small to show details of the route between Otter Creek and Middleton Township.

Movement of troops and supplies in 1812 and 1813 almost destroyed the roads of Upper Canada. A large sum was voted by the Legislature in March, 1814, for repairing the main roads.

As a settlement road "Talbot Street" ended at the Middleton-Windham Line on the site of Delhi. How it was originally intended to connect it with the Brantford Road is not clear.

By 1815 the main road had been established on the road allowance between Windham and Charlotteville townships and this road seems to have come to be regarded as a continuation of the Talbot Road. The allowance in front of the Eighth Concessions of Walpole and Rainham was "Cut out for Stage Road in the year 1829" and connected with the road between Woodhouse and Townsend and with a newly laid out road across Cayuga Township. Highway No. 3 follows the line of these roads as far as Canborough and a road from Canborough towards Gainsborough Township is still marked "Talbot Road" on some maps.

(d) *Ordinary Roads*

Settlers in Canada were under a vague obligation to clear half the surveyed allowance for road in front of their grants.

Normally, when an area was first settled, the inhabitants made trails "across lots", following road allowances or other survey lines only where it was entirely convenient. In some parts of the province, roads departing from the survey are called "given roads", a name which implies that they originally crossed private property and so could be opened, altered, or closed at the pleasure of the owner. There must have been a number of these "given" roads in this area before 1800.

To provide for the making and maintenance of roads it was enacted that every landowner, in addition to his settlement duty, should be liable to an assessed amount of work on the roads, called "statute labour". This was performed, in person or by proxy, on any "legal" road indicated by the magistrates (or later by the Road Commissioners for the District) under the superintendence of overseers, or "pathmasters", who were responsible for enforcing statute labour in their townships and reporting delinquents. Overseers of roads were among the officers who

might be elected at township meetings. If this was not done, they were appointed by the magistrates.

Although no records of town meetings in this area before 1800 have been found, statute labour was evidently being exacted and some roads had evidently been "established" besides the main highways already described.

(e) *1820-40*

The more important roads in this area are detailed in a "Memo of the principal Roads in the Province of Upper Canada" furnished by William Chewett (in 1821) to the Lieutenant-Governor. The Lakeshore, Dover and Talbot Roads are described as part of a single highway leading from the "outlet at Burlington Bay" by Niagara, Fort Erie and "Woodhouse", to the site of Simcoe; thence by the Windham Line and Talbot Road to Sandwich—a long course for one road. Among the "intermediate" roads were two from Queenston and Niagara Falls, "the latter called Lundy's Lane", which joined in Thorold Township and continued to the Grand River.

The roads in Norfolk County were considered fairly good in the 1830's; that is to say, in dry weather. Burwell mentions a good deal of rain from April 27 to May 14, 1840, which may have caused some of his difficulties. The number of taxed "pleasure waggons" was comparatively large from 1825. Few two-wheeled carriages are assessed until 1833, when the number suddenly jumps to 16 in this area. It drops again the following year and no four-wheeled carriages appear till 1839. The stages on the Brantford road in the 1820's, and apparently from the Lower Grand to Simcoe by 1829, used wagons. Coaches began to be used in good weather in the 1830's and were mounted on sleighs in winter, but wagons were used when the roads were heavy.

(f) *1842-67*

A great deal of roadwork was carried out by the new District Councils between 1842 and the end of 1849. Most of this was adjustments of line on existing roads, the opening (or occasionally closing) of stretches of concession roads, and the legalizing of short stretches of given roads to give access to mills or a better connection between travelled routes.

(1) Improvements in Technique—Stone and Plank Roads

The technique of roadbuilding was also improving. Before 1825 improvement seldom went beyond "turnpiking" in dry stretches and causewaying the wettest spots with log corduroy. When the roads were first opened, the trees were cut only low enough "for a waggon to pass over" the stumps, but later they were cut close to the ground. When a road was turnpiked it was crowned up from both sides with the plough, making shallow ditches for drainage and burying some of the stumps and boulders. Roadways were normally from 16 to 18 feet wide. As time went on better grading and ditching might be carried out. There is a reference in 1817 to the highway from Lake Erie being "ploughed down the hill to Cullver's Mill pond" where it crossed the site of Simcoe. Some of the worst stumps and boulders might be removed, but often the roadway wound around obstacles. As the roots and stumps rotted, a fairly smooth dirt road was formed. On the plains this would be accomplished sooner than through heavy forest.

The great change in this period was the planking or macadamizing of some provincial highways. Until about 1835 no form of surfacing is mentioned.

Gravel is seldom mentioned in connection with roads in Upper Canada before 1845. By 1850 it was being applied to main roads as a cheaper substitute for

Store (now dwelling) in Nanticoke Village — an attractive front of about 1860.

Old store block in Vittoria. This attractive block was built in separate units—the first probably in 1845-50. Vittoria was still a flourishing village in the 1850's, though it had ceased to be the District Town by 1826.

Norfolk Hotel, Port Dover. This building, while still unfinished, is said to have been used as a Militia Barracks in 1837-38.

broken-stone macadam. It was available in most parts of the province and could be screened with simple equipment and without much labour. Nevertheless, the gravel used before 1890 was often coarser than it should have been. Gravel was ground down rather more quickly by traffic than the coarse macadam, though it did not form quite so satisfactory or lasting a surface. Without underdrainage, both types of stone road became impassable when the frost was coming out of the ground and might remain so for more than a fortnight. A wet autumn might make them nearly as heavy. It was here that the plank road had the advantage over other types in use: if properly maintained it was good at any season and was largely free from mud and dust.

In constructing a plank road, longitudinal rows of timbers were usually laid down as sills, the earth rammed between them, level with their surfaces, and the planks laid across them, producing a heavier version of the board sidewalks still common in the early part of this century. The quantity of lumber required was enormous and the labour considerable, though much less than for any kind of paving then in use. Only paving could produce an all-weather road to equal plank and only paving with wood-block provided a surface so satisfactory for horse-drawn traffic. The increase in speed and comfort was revolutionary.

After the two provinces were united under one government in 1841, the British Government made a large loan to the Government of the United Canadas to be expended on public works. A great part of the sum apportioned to Upper Canada (or Canada West) was expended on building plank roads, mostly on existing highways, but sometimes for long stretches on a new line laid out directly from one point to another without regard for the surveyed grid. The first plank road in this area, the Hamilton and Port Dover Plank, followed such a new line from Caledonia to Port Dover. It was almost all planked and crossed the River Lynn on a new swing bridge. It seems to have been begun in 1842 and to have been finished early in 1844. This highway (now No. 6) replaced the older stage road (No. 3). By 1851 part of the highway between Simcoe and Jarvis was "in very bad order, with a considerable extent of corduroy". Travellers were advised to go the extra five miles around by Port Dover.

(2) Public and Private Toll Roads

These government highways were toll roads, for the experiments of the 1830's had shown that this was the best way to provide for maintenance without greatly increased taxation. In the years 1846, 1848 and 1849 the Port Dover Road brought in a total net profit of £3,911. Two private companies were incorporated to build roads in this area under the Act passed in 1849. These roads were not finished in 1851, but W. H. Smith shows their routes on his map of Norfolk and Middlesex Counties as if complete. The "plank and gravelled" road from Port Dover to Otterville followed the existing highroads along the routes of the present Highways Nos. 24 and 3 to beyond Fredericksburg (Delhi) and thence, for a little more than 4½ miles, the route of Highway No. 59, continuing in a direct line almost to Otterville before turning northward into the village.

The Normandale and Fredericksburg Plank Road was surveyed to follow a similar new, direct road from Normandale to the First Concession at Lot 12 and thence up the line between Lots 12 and 13 to the Windham Line near Atherton. This route is now followed by an improved county road as far southward as the turn-off for Turkey Point and is open to Normandale.

Plank roads proved exceedingly costly to maintain. It is noteworthy that though the gross receipts on the Hamilton and Port Dover Road increased from

£1,500 in 1846 to £5,961 in 1849 the expenses of collection and repairs increased from £219 to £4,150 in the same period. The sharp increase of expense had come in 1847 or 1848, when the road had been 4-5 years in use. Plank was gradually replaced by macadam or gravel. Only a few plank roads had been built wide enough to accommodate two lanes of traffic; some had a single lane of plank with a macadamized road alongside, onto which lighter vehicles could turn out to give the right of way to loaded wagons or to coaches. Others were provided only with turn-outs at intervals—a less satisfactory arrangement.

Between 1840 and 1890 there was a marked general improvement in the state of the roads. By the 1880's machinery was available to lighten the labour of road-making to a certain extent. However, the improvement did not keep pace with the demands of the public. A movement for better roads just before the turn of the century resulted in the resumption of government subsidies for road maintenance. With the advent of the motor vehicle the Province again assumed the responsibility for certain highways and the Department of Highways was established in 1913. Almost all the improved roads of the 1850's are now surfaced Provincial Highways or County Roads.

2. RAILWAYS—1850-1900

A railway from Port Dover to Brantford or Hamilton was being discussed as early as 1835, but the first railway company to begin work in this area was the Woodstock and Lake Erie Railway and Harbour Company. This company was chartered in 1847 to build a line from Woodstock to Port Dover but, like all the railway companies chartered before 1849, had great difficulty in raising the necessary funds, and its charter remained dormant.

It was the second period of active railway building after Confederation that provided lines in actual operation. The "Erie and Niagara Extension Railway Company", chartered in February, 1868, was re-chartered in December, 1869, as the "Canada Southern Railway Company". This line, from St. Thomas to Fort Erie, was intended to form part of a direct line, controlled by American interests, linking Chicago with New York. It crossed Norfolk County from near La Salette, by way of Windham Centre, Waterford and Villa Nova, to Townsend Station on the old "Indian Line", and was shorter than its competitor, the Great Western. The Haldimand County Historical Atlas, 1879, shows the "Hamilton and Lake Erie Railway" as complete across that county, through Caledonia, to the Norfolk County line beyond Jarvis, and presumably to Port Dover.

In 1882, the Great Western, which had absorbed the Brantford, Norfolk and Port Burwell Railways, amalgamated with the Grank Trunk Railway; the "Grand Trunk, Georgian Bay & Lake Erie" system absorbed the Port Dover and Lake Huron. The Canada Southern, which had amalgamated with the Great Western, was absorbed with it into the Grand Trunk System. The Northern and Northwestern was also absorbed by the Grand Trunk. The right-of-way of the Canada Southern was by then being used by the Michigan Central Railroad, which still operates this line.

CHAPTER 8

EARLY INDUSTRIES

1. GRIST MILLS

Apart from hand grinding the only way to obtain flour or meal at first was to carry the grain sixty or seventy miles by water to Zavitz's mill at the Sugar Loaf,

or by land to Fairchild's or the Mohawk mill, both near the site of Brantford. The water journey was usually preferred, though if the winds were light or contrary it might take more than a week.

(a) *1797-1815*

The identity of the first local mill is not quite certain. It was an early tradition in the Ryerse-Ryerson family that Samuel Ryerse's grist mill was the first in Norfolk County.

The Backhouse grist mill, still standing on Lot 17, Concession II, Walsingham Township, would appear to be the fourth grist mill in the Long Point Settlement and the second in Walsingham. The family account, that the sawmill was finished in 1797 and the grist mill in 1798, may be derived from private records or from tradition. At least ten mills are listed as probably built in the Big Creek Region before 1805.

(b) *1816-1856*

Robert Gourlay's statistics, published in 1822, indicate that most of the mills burned during the war had been rebuilt by 1817 and a few new ones added. Gourlay's figures were obtained from the residents in each township and are probably reliable.

The later figures for grist and flour mills are given in the table of industries. The trade was subject to the same stimuli as the lumber industry, but the number of mills grows less rapidly before 1880. There was, however, a great increase in production as mills were modernized. The expansion in the 1870's is due to the completion of railways in this area. It corresponds to a local increase in agricultural production and in lumbering, but was certainly affected by influences outside the area. The millers were grinding some western wheat and finding their market in less developed parts of Canada as well as abroad. After 1900 a decline begins. There were 27 flour and grist plants in Norfolk County in 1911, but there are very few today.

2. SAWMILLS

Sawmills attracted much less attention from officials, travellers and articulate settlers than did grist mills before 1830. Consequently there is little information about independent sawmills and not much about those attached to grist mills. "Saw and grist mills" were the rule before 1800; a grist mill without a sawmill was rather exceptional. A sawmill cost considerably less, did not require a separate dam and, if built first, made it much easier to put up a fair-sized grist mill. Though pioneers did not consider sawn lumber as essential to their comfort as wheat flour and meals, they were very willing to be relieved of the time-consuming labour of pit-sawing. In this area a sawmill immediately proved a paying investment. Evidently the toll charged for custom sawing was more satisfactory than the toll for grinding, and lumber accumulated at the mill found a ready local market.

The first sawmill in Middleton and Houghton was assessed in 1825 and can be identified with Mabee's sawmill on Lot 43, Concession III of Middleton.

The assessment returns indicate clearly that the number of sawmills grew slowly before 1835 and that the great expansion of lumbering came about 1843. Before 1830 most of the new sawmills were in what may be called "recently settled" townships, in Middleton, Houghton, Windham and Walpole. In the thirties, mills were being built in all the townships, but not yet in great numbers. Just after 1840 a large number of new mills were built.

The development of lumbering can be related to several causes including a steady growth of population, which increased the local demand for lumber and was much more rapid after 1840. Until 1826 export was almost entirely confined to the region above Niagara Falls and cannot have been large. It grew only slowly after the establishment of the canals because areas to the east and south-east were still well timbered. In the early forties local demand was immensely increased by the planking of roads, internal communications were improved and villages expanding. Harbours were improved in 1835-40 and export to the United States began and increased steadily. Export had also begun to Montreal from the Lake Erie Region and by 1847 it was stimulated by the opening of a new St. Lawrence seaway and by preferential tariffs in Britain.

Except for the last mentioned, these favourable conditions continued into the 1850's and were enhanced by other developments. Steam sawmills were introduced about 1845 and were fairly numerous by 1851. Circular saws were available not long after, but were adopted very slowly, especially in the old water mills. Gang saws, however, were more common in the new mills and there were other technical improvements and an increase in size. Railway building outside the area helped to reduce the cost of transport by 1857. The effect of these conditions can be seen in the total number of sawmills reported from Norfolk County. These rose from 55 in 1845 to 86 in 1848, 90 in 1850 and 112 in 1851-52. The decline in numbers of sawmills in the later fifties, sixties and seventies was due more to the disappearance of smaller water mills. Millers no longer required sawmills to add to the profits of their establishments and farmers gradually ceased to run a sawmill as a sideline. Lumbering was slowly being concentrated in specialized large mills, not all located in the larger villages.

Figures for the various townships show that most of the 48,250,000 feet of lumber produced in 1851 in Norfolk County came from the western section—Walsingham, Houghton, Middleton and adjoining parts of Charlotteville and Windham. Of the individual townships, Walsingham and Houghton produced the largest quantity, followed by Townsend, Middleton, Charlotteville, Woodhouse and Windham in that order. Outside the county, Walpole produced 9,100,000 feet, 700,000 feet more than Houghton; Norwich (4,800,000 feet) was 530,000 feet behind Townsend. Production in Burford was naturally less—985,000 feet, rather over half the production of Windham. There were 19 steam sawmills in Norfolk County, 7 in Townsend, 4 each in Walsingham and Houghton, 2 in Windham, 1 each in Woodhouse and Middleton.

3. OTHER INDUSTRIES

The first industries to develop out of handicrafts in the pioneer period were distilling, wool-dressing, tanning and the making of lye and potash. All these required a certain amount of equipment and became specialized very early. Meade's tannery and Henry Medcalf's carding machine are the only ones mentioned in reliable sources.

Michael Smith gives six stills in Woodhouse and three in Townsend in 1812. Distillers paid for their licences direct to the Inspector-General and stills were not assessed. None of the other industries seem to have been taxed. There are figures for stills in the London District after 1820, but no locations are given and it is hard to be certain where they were located. There were several stills at Simcoe in 1820, some others in Woodhouse, several in Charlotteville and two or three in Townsend. The number of licences grows less by 1824, as the millers ceased to dispose of surplus wheat by distilling it into whisky.

The other industries are best followed on the table. Most of them declined after 1900, except those connected with agriculture.

MANUFACTURING ESTABLISHMENTS, NORFOLK COUNTY
CENSUSES 1851 TO 1891 INCLUSIVE

Type	1851	1861	1871	1881	1891
Flour Grist Mills	19	13	20	32	42
Cooperages	—	3	14	17	19
Sawmills	112	77	62	59	63
Shingle Mills	—	7	29	8	6
Sash, Door and Blind	—	—	2	9	6
Carding and Fulling	6	—	1	2	—
Woollen Factories	1	2	4	3	4
Tanneries	7	11	12	7	6
Foundries	5	2	—	—	—
Agricultural Implements	—	—	4	4	—
Blacksmith Shops	—	—	61	80	118
Pump Factories	—	—	5	5	7
Carriage and Wagon	—	5	35	40	41
Cabinet Ware Factory	—	1	—	—	—
Soap and Candle Factories	—	1	—	—	—
Asheries	—	—	2	4	2
Distilleries	6	3	—	—	—
Breweries	3	1	1	1	1
Cheese Factories	—	—	11	20	33
Brickyards	—	1	—	—	—
Shipyards	—	1	—	—	—

CHAPTER 9

TOWNS AND VILLAGES

The Oxford and Norfolk Gazetteer and General and Business Directory for 1867 lists more than 30 places with post offices in the part of Norfolk County included in the Big Creek Region Authority. With Nanticoke Village in Haldimand County, New Durham and "Derby" (Harley) in Brant County and some villages without post offices which are nevertheless given some space in the directory, the total would be about 35-36 villages and one incorporated town.

Most of the places with post offices in 1867 could reasonably be called villages and could show some combination of store, inn, craftsmen's shops, mill, church or school, with 50 to 500 inhabitants. A number of new villages of this kind must be added in the latter part of the century and a complete list would probably exceed 40, in addition to the five incorporated municipalities. Some account will be given

of the villages formally laid out before 1825 and of the four incorporated towns and one incorporated village at present in the area. This covers practically all the places that had any importance before 1840, except Port Ryerse and St. Williams.

1. VILLAGES PLANNED BEFORE 1825

Simcoe planned to found three "towns" in connection with the Long Point Settlements—Lynn, Charlotteville and Middleton. He chose sites for the two first in 1795 and directed that reserves should be made for them. Middleton was to be half-way in a direct line between the town of Charlotteville and the Forks of the Thames, where Simcoe had selected a site for the town of "London", which he hoped would eventually become the capital of Upper Canada. In 1802 nothing had been done to locate the site of "Middleton"; the reserve for "Lynn" had been located but the site has remained almost vacant until very recently. Charlotteville, intended to be the capital of the District of London, had a brief history. By 1804 a Court House had been built and the Quarter Sessions were held there until 1812, but after the war the courts were moved, the town faded rapidly and the area is now part of the Provincial Park and Forest Station at Turkey Point.

"Clarrence", the first village in the area laid out and surveyed by private enterprise, was near the mouth of Young's Creek. The first lot was sold to Major Ryerse's blacksmith, James Conklin, who had time to build the forge and put up a frame for a house before he was drowned in October, 1797. This is a very early date for the founding of a "town" in Upper Canada not laid out by government.

Conklin's tragic death, however, led Samuel Ryerse to reconsider his scheme and decide that he did not want a town so close to his own establishment. He purchased Conklin's property from the widow, withdrew the other lots from sale, and was content to provide a dwelling for his miller and some small log cabins for his hired hands. The town of Clarrence ceased to exist, but the hamlet of Ryerse's Mills was a busy place during the war, with the coming and going of ships and troops and the constant loading and unloading of stores.

(a) *Dover*

When the Acting Surveyor-General reported on the reserve for a town at the mouth of Patterson's Creek, a village was actually beginning to form about two miles farther upstream, near the mills built a few years before by Daniel McQueen. The locality seems at first to have been known as "Dover Mills", but there is an official reference to "the Village of Dover in the Township of Woodhouse" in 1808 which implies that the village was by then well established. Dover seems to have been rebuilt fairly quickly after the war of 1812. There may have been a tendency for more people to build nearer the mouth of the river than at the mills, but a village of some sort existed at the old site in the 1820's. This was important enough in 1832 for a "Dover" post office to be established. This was moved to Port Dover in 1836 and the old village dwindled during the next ten years. At present there is little building on the old site of Dover, though the growth of Port Dover may soon extend the town in this direction.

(b) *Vittoria*

The laying out of a surveyed village plot for Vittoria in 1816 would in any case place this among the earlier villages of this area, but it was because something in the nature of a village already existed near Tisdale's Mills that this location was chosen in 1815 to replace "Charlotteville" as the seat of the courts of the London District.

The removal of the courts and District Offices from Charlotteville in 1815 must have made "Vittoria" a much busier place and produced the first formal lay-out in 1816.

Vittoria was the principal village in Charlotteville Township. Estimates of population rise from 300 in 1846-51, 400 in 1853, 500 in 1857-67, to 600 in 1871. There was the usual assortment of small industries—grist mills, distilleries, tanneries, woollen mills (by 1846), carriage-making, cabinet-making, etc. A brick-yard in the eastern part of the village is mentioned in a road description of 1834.

The county Registry Office was moved to Simcoe by 1850, but Vittoria remained the seat of a Division Court, and a township hall was built there after Charlotteville Township was incorporated under the Act of 1849. In the early 1870's Vittoria was among the four larger villages in Norfolk County. It was, however, far from any railway; villages better situated in this respect were growing rapidly, while Vittoria seems to have passed its peak of population by 1880. It is still a fairly large village and an attractive place.

2. INCORPORATED TOWNS

(a) *Simcoe*

The first resident within the limits of the town of Simcoe seems to have been Philip Risch, who was living on Lot 15 in the Gore of Woodhouse near the corner of Windham Township by 1796.

No dwellings appear to have been burned during the war and the Davis sawmill also escaped; so recovery was quicker than at Dover. Some inhabitants of that unfortunate village had probably moved to this vicinity, perhaps occupying houses whose owners had forfeited them by going to the United States.

Several different names had been used for the village, but when the post office was opened about 1820 the name "Simcoe" was chosen. In 1824 the town was mentioned as a possible successor to Vittoria as the capital of the London District, but it was not until the Talbot District was formed in 1837 that Simcoe attained the rank of District Town. In 1833 a traveller describes Simcoe as "a very thriving, smart little village" and there are similar accounts from other sources, but very little detail about the size of the place or the type of business carried on there.

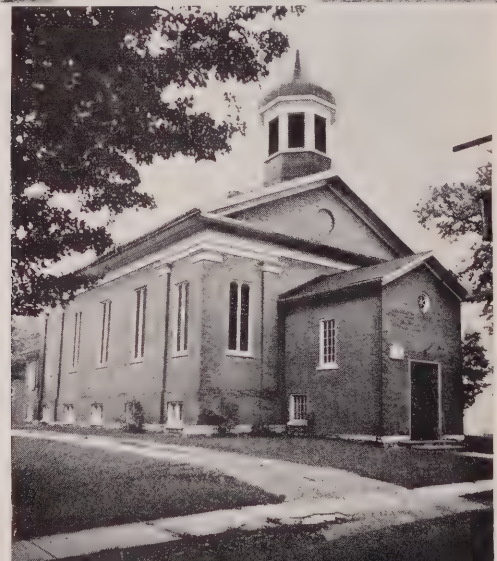
The village was believed to contain 1,400 people in 1846, an estimate which may have been too high, though there had certainly been considerable growth since the 1830's. The chief additions to the industries established in the 1820's were Kent's brewery and Polly's foundry, but there is a respectable list of professions and trades, a surprising number of stores and taverns, a weekly newspaper, the "Long Point Advocate", and an agency of the Gore Bank.

Simcoe was incorporated as a town in 1850. The provincial census of 1851-52 showed a population of 1,452. The progress in the previous five years was shown less in an increase in size than in other ways. The Van Norman smelting works and foundry had been moved here in 1850. There were two new tanneries, a soap-and-candle factory and a third distillery. The carding mill was gone and the millers had given up their sawmills, but a new one had been built just outside the town. The "Simcoe Standard" and the "Norfolk Messenger" were competing with the "Long Point Advocate." Where there were said to have been only two or three brick houses in 1846, the 1851 census shows 19 out of a total of 230 inhabited houses. There were no log houses and only eight shanties.

This improvement in building continued during the early fifties and produced a number of the fine houses still to be found in Simcoe today. The town was growing fairly quickly in this decade and was evidently prosperous, in spite of the

Christ Church, Anglican, Vittoria. "Though not completely finished" when Archdeacon Bethune visited it in 1848, this church had been used for services for three or four years.

United Church, Rockford (Methodist) 1864.



Baptist Church, Vittoria — The Charlotteville Congregation, organized in 1803, built its first church in 1807 and replaced it with a brick one in 1851. The porch is a later addition.

failure of the proposed railway. During the sixties the population did not increase, though there is little evidence of any decline in business, and the period is marked by the increasing development of some businesses, such as carriage-making, and the introduction of some new ones, such as brickmaking and, after 1867, the manufacture of woollens.

The completion of the railways in the mid-seventies produced a sharp rise in population. The census figure in 1881 was 2,645. The next two censuses show very little variation, though again there is no evidence of any decline in prosperity. In fact, Simcoe seems to have experienced few of the sudden fluctuations that have affected some Ontario towns, and to have suffered less from the growth of larger centres and the concentration of industry that was taking place in the last quarter of the nineteenth century. This is perhaps due to its position as a regional centre rather distant from the larger cities of the time.

(b) *Port Dover*

The old village of Dover had been created by its mills; the new Port Dover was brought into being by the growing traffic on Lake Erie in the 1820's and 1830's. After the opening of the Erie and Welland ship canals, 1825-30, the need for better harbour facilities became pressing. The heirs of Colonel Samuel Ryerse succeeded in forming a company and building piers at the mouth of Young's Creek. These were sufficiently completed by the end of 1833 to be used during the next season, and the new harbour immediately began to draw most of the trade from the "Port of Dover".

The year 1843 marked an epoch in the history of Port Dover. The new plank-and-gravel road to Hamilton had made good progress by the beginning of October and seems to have been finished in 1844. Timber and stone had been collected for the harbour works.

Delay in finishing the harbour was, however, having little effect on either the expansion of shipping or the growth of the village. An estimate of 300 inhabitants in 1844 may be rather too high, but it illustrates the current opinion of Port Dover's development.

In spite of the variety of business which developed, Port Dover remained only a large village, the largest in Norfolk County. The population grew from about 600 in 1851 to 700 in 1853 and about 900 in 1857. This estimate is repeated ten years later, but in 1869 it is "about 1,000". The population in 1877 was 1,100. The first census after incorporation as a village, that of 1881, gave Port Dover 1,146 inhabitants. An estimate of 1,400 in 1888 may be too high, although a peak of population was probably reached about that time. The census of 1891 returned 1,213 people for Port Dover, the highest census figure before 1921. The next two censuses show a population declining very slightly but remaining over 1,100. Growth began again during the First World War and the figure in 1921 was 1,462.

Its popularity as a resort has been a source of business to Port Dover in this century and the village also benefited by the general prosperity brought to the area by the great expansion of the tobacco trade and by the development of the country as a whole. Port Dover has grown steadily since 1921; the village became a town in 1953 and the last municipal return shows a population of 3,125.

(c) *Waterford*

The houses and mills erected in Townsend Township on the Nanticoke by 1799 represent the first beginnings of the village of Waterford. It is hardly likely

that they constituted anything that could be called a hamlet, but it was not long before something of the kind came into being. The name "Waterford" was adopted in the 1820's and a post office was opened about 1826. Very little can be learned about Waterford in the 1830's. A traveller in 1833 mentions the very large number of sawlogs in the mill pond. The village was evidently growing, though not very rapidly.

Waterford remained essentially a market town, the distributing centre for the most productive farming area in the county. The industries were directly connected with farming or lumbering. Before 1867, the owners of the mills and more important plants were usually general merchants as well, and later they were often active professional men. The number of stores was large in proportion to the number of inhabitants and this was true also of more specialized shops, especially those catering to the country trade, such as harness shops. There were usually from three to five doctors practising in Waterford, and one or two dentists and lawyers.

(d) *Delhi*

The existence of a village or hamlet in Middleton may be said to date from the opening of "Sovereign's tavern", about 1826. Frederick Sovereign is said to have built a new inn which was "first licensed in 1834" and became the "Union Hotel", probably in 1841. Lawson's tavern is mentioned in 1840.

During the 1850's Fredericksburg maintained its place as fifth in population among the centres of the Big Creek Region. By 1856 the name of the post office was changed to "Delhi" to prevent confusion with other "Middletowns" and "Fredericksburgs".

The completion of the Air Line Railway was a new stimulus to the growth of Delhi; by 1877 the population was 750. Delhi, after the completion of the railway, benefited from the expansion of lumbering in the adjoining townships, and in the eighties was feeling the advantage of the agricultural expansion which followed. The village seems to have been little affected by the agricultural depression of the late 1880's and early 1890's. Almost all the industries of 1877 were in operation 20 years later and some new ones had been added—a cheese factory and a cannery by 1888 and a rope factory by 1895. At that date the village was nearing a peak of population with "about 900" inhabitants. The first two censuses after incorporation, however, show almost the same population—823 in 1901 and 825 in 1911; ten years later the figure was down to 733.

Such a check in growth was usual among the smaller municipalities in Ontario about the turn of the century. It came somewhat later at Delhi and was probably more directly connected with a decline in the prosperity of the countryside. It did not last long; by 1931 the village population had passed 1,100; twenty years later the census return was 2,517. This rapid growth was directly due to the development of the tobacco industry. Delhi was incorporated as a town in 1954 and is now the second town in the area. The 1962 municipal return gives Delhi 3,447 permanent residents, but during the tobacco-picking season the number is said to be much greater.

3. INCORPORATED VILLAGES

(a) *Port Rowan*

Thomas Welch called this locality "John Courtright's Landing" in 1797; about ten years later the landing became known as "Wolven's", from the name of the settler who had bought the Courtright Lot.

In spite of shallow water near the shore, some vessels did make use of this anchorage, especially smaller schooners able to clear the bar off Pottahawk Point. It was a good location for smugglers; there were no customs officials before 1830 and for a long time no magistrate lived within a mile or two of the place. There was also a certain amount of coming and going along the Lake Road and to the Backhouse mill and this combined with the activities at the landing and at Murphy's Creek to make this a good location for a "house of entertainment".

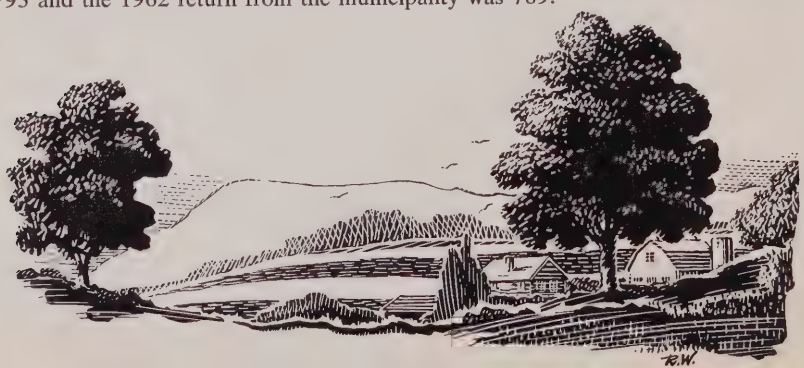
Insufficient facilities for discharging cargo helps to explain the rather gradual growth of Port Rowan between 1825 and 1845. Another reason is the slow development of Walsingham Township. That coastal trade on Lake Erie was expanding in the late 1830's is shown by figures given in connection with the new harbour at Port Ryerse. However, Port Rowan in 1845 still consisted only of one store, one tavern and 16 dwellings. The population was 100 persons; there were now a post office and a resident collector of customs. The next two or three years marked an epoch in the development of both village and township. The sudden expansion of lumbering and the building of new sawmills in Walsingham have already been mentioned.

The population of the village in 1850 was at least double that of five years earlier. More important, the volume of business had increased to an even greater extent. In 1849 the exports were already considerable; they consisted almost entirely of lumber in various forms—6,570,000 feet of pine saw logs, 6,201,250 feet of pine lumber, smaller quantities of walnut and whitewood lumber, lathing, shingles, shingle wood, hop poles and two ships' spars. The only other articles listed were a single "chain cable", 800 bushels of potatoes and furs to the value of $155.65. The following year the quantities of lumber and the total value of exports were lower. However, the value of furs had more than trebled ($482.50); some flour was exported and 100 pieces of furniture, the product of J. Davis's cabinet shop. The lumber trade was to expand considerably during the 1850's; in 1857 the annual shipments of sawn lumber were estimated at 14,000,000 feet and of saw logs and spars at 25,000,000 feet. Twenty-five years later the export duty on logs alone was $20,000 (possibly including shipments from Port Royal).

During the next ten years the business of the Port continued to be considerable; exports between June, 1864, and June, 1865, were valued at $246,000 and grain is mentioned in addition to lumber.

In the 20 years following 1857, Port Rowan more than doubled its population and its local importance grew considerably.

The population of Port Rowan was estimated at about 1,000 in 1888 but the census of 1891, the first after incorporation, gives the village 649 inhabitants and ten years later the figure is 657. The village was certainly appreciably larger in the 1880's than at the turn of the century. There has been very little change since 1921, the census returns fluctuating around 700. The 1951 census return was 793 and the 1962 return from the municipality was 789.



LAND 2

CHAPTER 1

THE FACE OF THE LAND

1. INTRODUCTION

The Big Creek Region includes all or part of five counties—Norfolk, Elgin, Oxford, Brant and Haldimand—and 14 townships. There are several towns and villages—Simcoe, Delhi, Port Dover, Waterford and Port Rowan—and many hamlets.

In addition to the Big Creek itself, there are a number of other streams in the region, including Clear Creek, Dedrich Creek, Lynn River and Nanticoke Creek. These and many more small ones flow into Lake Erie. There are natural pondings within the watershed but few are of sufficient size for recreational or other extended use. At best they are suited to stock watering and, perhaps, irrigation. There are, of course, a number of constructed mill and other ponds such as those at Waterford and Simcoe.

At its widest the region extends about 37 miles east-west. The north-south dimensions are about the same. The Big Creek Region covers an area of approximately 614 square miles, or 393,000 acres.

In altitude the area ranges from about 575 feet at the lake to about 1,100 feet in the moraine to the north-west. Most of the land is under 800 feet elevation. The slope of most of the sand and clay plains is quite mild and the morainic ridges rise above them 50 to 75 feet.

2. BEDROCK GEOLOGY

The backbone of Ontario is rock, either stratified waterlaid sediments which, through millions of years, have become cemented by chemistry and time, or igneous rocks. In the former group are the shales, limestones and sandstones, and in the latter group the granites and other plutonic materials. Most of Southern Ontario is underlain by sedimentary strata, which in turn are underlain at great depth by plutonic rocks. The latter are those common on the Canadian Shield.

The sedimentary bedrocks of Southern Ontario represent three major periods of geologic time—the Ordovician, the Silurian, and the Devonian. The Ordovician rocks are found east of the line connecting Collingwood and Hamilton. They are separated from the western portion of Old Ontario by the prominent Niagara escarpment. The Silurian rocks occupy a band of country running from the Niagara River westerly to Woodstock and Hamilton and thence north to Bruce and Manitoulin. The Devonian rocks occupy the balance of the country west to Lake Huron and the Detroit River. The division between the Devonian and Silurian systems is marked by the Onondaga escarpment which may be seen between Fort Erie and Hagersville, beyond which it is covered by later deposits of glacial till and lacustrine materials. Each of the above systems is composed of a number of formations, which may contain several strata of different rocks.

Nearly all of the Big Creek region is underlain by the limestones of the Onondaga formation. A small area, particularly in Burford Township, is underlain by Silurian rocks of the Salina-Bertie-Akron formations. These contain bits of shale, dolomite, salt and gypsum. The latter are confined to the Salina.

Except in the eastern portion of our area the bedrocks are thickly covered by a mantle of drift which ranges from 50 feet or less in thickness in the eastern portion of the watershed to 300 feet in thickness at Port Rowan. Outcrops of cherty

Onondaga limestone are found in a few places—Villanova, Rockford, No. 3 Highway east of Renton and to the south of this place, and in a small valley east of Tyrrell. The rock has been quarried in several places but this development has not been significant.

In the area as a whole, the bedrocks are of little importance. They offer no impediment to agriculture or construction. The well waters they provide, if fresh, are often hard and many are not potable because of sulphur content. The sands of the Norfolk plain may be 50 feet or more thick over compact till or stratified materials. They provide good water supplies with minimum difficulty.

3. CLIMATE

The climate of this part of Ontario may be described fairly well from the weather records of the several recording stations in the locality. A better understanding of the regional climate may be had, however, only after recourse to the statistics covering a much wider area.

Most of the Big Creek Region watershed lies within a climatic region called by Putnam and Chapman the "Lake Erie Counties". Nearly all of the sand plain and the southern portions of some of the moraines lie within this region. The northern section of higher elevation belongs to the region described as the "South Slopes".

The Lake Erie Counties climatic region varies in width and extends from Toronto on the east to Lake Huron on the west. Its northern boundary extends south-westward from Toronto through Dundas to near Tillsonburg, and thence northwestward to reach Lake Huron south of the Huron-Lambton county line. The region occupies all of the land south of this line with the exception of that belonging to the Niagara Fruit Belt and the area west of Ridgetown-Sarnia. The South Slopes region extends from western Middlesex to Frontenac County.

Putnam and Chapman have described these two regions as follows:

Lake Erie Counties

> "This region, bounded by Lake Erie on the south, Lake Ontario to the east and Lake Huron to the west, has a climate modified by the influence of these lakes as shown by the mean daily range of temperature, frost dates and length of growing season. Although having a warm, early season it is not quite so well favored as the three regions previously outlined. It is an area of gentle relief, varying in elevation from about 600′ to slightly over 800′, the most prominent features being the crests of some of the glacial moraines.
>
> "Except in the Niagara Peninsula, the northern boundary is formed by the annual isotherm of 45°. Winter temperature ranges from 23° to 24°, Spring temperatures are about 43°, with 42° along the northern border and also along the shore of Lake Erie. Summer temperatures average about 67° with 66° along Lake Erie. Fall temperatures vary from 48° to 50°, being warmer along the lake shores. The extreme low temperatures range from —21° to —35° and the highest temperature ever recorded is 106°. The frost-free period varies from 160 to 135 days, depending on the distance from the lakes. On the other hand the growing season has a fairly uniform length of about 200 days from the middle of April to the first week in November.
>
> "The average precipitation is 33.8 inches, but is heavier in Norfolk, Elgin and Middlesex and lighter both to the east and west. The normal snowfall varies from 40 to 90 inches in the same manner. The growing season receives

slightly over half the precipitation. The P-E index for the three summer months ranges from 10.5 to 13.5. The drought frequency is about 20, strangely enough, being higher in the areas receiving greater precipitation. The greater rainfall in the central part of the region is not apparent because of the sandy soils."

The South Slopes

"To the north of the Lake Erie region and the Lake Ontario shore there is a belt of country with a southern exposure, in which the climate is somewhat milder than that of the regions to the north, but which does not enjoy the modification of the lake influence to the extent of the first-mentioned areas. In altitude, most of the area ranges from 500 to 1000 feet above sea level."

There is some correspondence between the northern boundary of the Lake Erie Counties region and that of Halliday's Deciduous Forest Region. The latter notes that this region, because of favourable climatic and soil conditions, allows "for the sole distribution in Canada of many Deciduous Forest species". He also observes that "a large number of these species find their northern limit here".

There is perhaps no particular climatic control governing the growth of agricultural crops from one region to the other but there is no doubt that for some crops at least some varieties will fare better in one zone than in another. Length of time to maturity, length of frost-free season and length of growing season are important factors respecting variety suitability. Crop varieties should be selected with reference to climatic conditions in order to obtain the best yields. At least one crop, peaches, is restricted to the lakefront, chiefly because of the more equable climate found there.

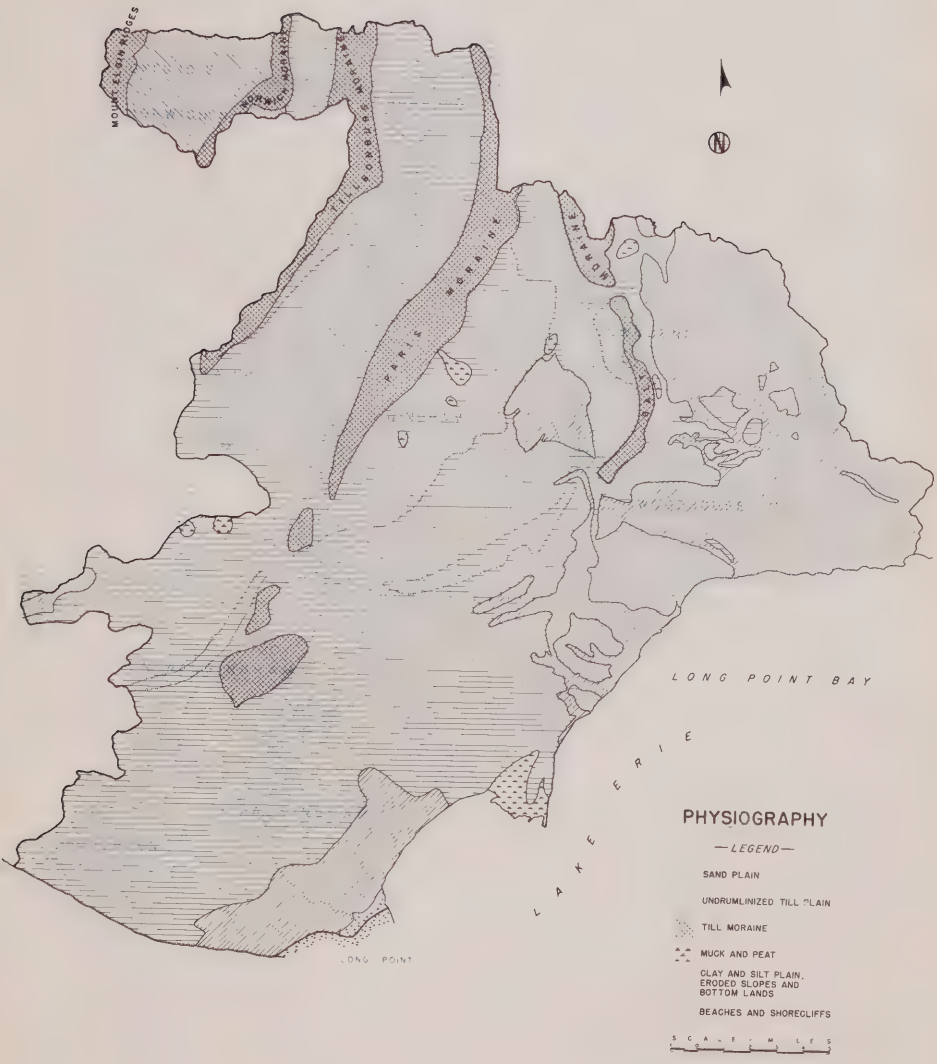
4. PHYSIOGRAPHY

During the past million years, Southern Ontario has been covered at least three times by major, continental glaciers. The last of the ice, that of the Wisconsin glaciation, vanished from the Big Creek region perhaps 15,000 years ago. Each of these major ice advances was marked by many minor, often local, fluctuations in the ice front.

Nearly all of the present-day topography of the area stems from the activity of the Wisconsin ice and particularly of the fluctuations affecting it before it finally withdrew. Coincident with the ice recession, resulting from climatic ameloriation, there came vast outpourings of glacial meltwaters. These were dammed up to form extensive glacial lakes by the as yet unmelted ice and by the new lines of hills created by the ice. These lakes were important in the creation of extensive level plains of sand, silt and clay which are common in the region and over much of Ontario.

The glaciations of pre-Wisconsin age are of small significance in the Big Creek area, particularly in the eastern section where the drift is thin. Westward they may be more important in providing aquifers and impermeable layers affecting the supply of potable water. Perhaps, too, some of the moraines have formed over pre-Wisconsin deposits.

Several types of glacial landforms may be recognized in the Big Creek region. Those moulded by the ice itself include the till moraines and till plains. The meltwaters off the ice carried tremendous loads of material and these glacial rivers, debouching into the lakes and dropping their sediment load, gave us the sand, silt and clay plains which we see today. Associated with these glacial lakes were shore-


MOUNT ELGIN RIDGES
NORWICH MORAINE
TILLSONBURG MORAINE
PARIS MORAINE
MORAINE
LONG POINT BAY
LAKE ERIE
LONG POINT
PHYSIOGRAPHY
—LEGEND—
SAND PLAIN
UNDRUMLINIZED TILL PLAIN
TILL MORAINE
MUCK AND PEAT
CLAY AND SILT PLAIN, ERODED SLOPES AND BOTTOM LANDS
BEACHES AND SHORECLIFFS
SCALE - MILES

lines and lines of sand dunes. Post-glacial activity has given us the present drainage pattern, the peat and muck deposits, the present variety of soils, and the bluff cut by Lake Erie. The spits of Long Point and Turkey Point are creations of Lake Erie.

During the general retreat of the ice sheet the Erie lobe (occupying and spreading out from the Lake Erie basin) was probably of most importance in building much of the watershed scenery. Over a period of time it advanced and receded several times, from and to the general area of present Lake Erie, and in the course of each advance or retreat constructed several moraines. Portions of these moraines were either constructed under water or were later covered by lake waters and smoothed. Within the watershed the Paris and Galt moraines are sandier than the others. The terminal stretches of several of the moraines have been covered intermittently by deltaic sands and a beaded aspect produced with the higher portions protruding above the sand.

The moraines are long, knobby ridges built up of glacial till, an unconsolidated, unstratified mixture of clay, sand and irregularly-shaped stones and boulders. The till of a moraine may range from coarse and bouldery to heavy and largely stonefree. Except for the Paris and Galt which are sandier, the moraines in the watershed tend to the latter type. The irregularly-shaped depressions between the knobs are frequently poorly drained and may contain peat or muck deposits.

The heavier, relatively stonefree soils of the moraines belong to the Huron catena. The soils of the Guelph catena have developed on the somewhat stonier, lighter tills where these occur. The well-drained members of both catenas are fairly fertile but subject to erosion when cultivated. They are unsuitable for the production of flue-cured tobacco but are highly satisfactory for general, beef and dairy farming and for some cash cropping. There is often decided contrast between the rural landscape on the moraines and that on the sand plain.

The till plain occupies only a small area and is confined to the north-west section of the watershed. While the general aspect is similar in many ways to that of the moraines the topography is more subdued and the slopes are longer and not so steep. Drainage imperfections are often widespread. A till plain is formed under a moving mass of ice, rather than at the perimeter of a lobe as is the case with a moraine. In this area the land use is much like that found on the moraines. Perhaps the chief conservation problems involve drainage and fertility improvement.

Coincident with the recession and stagnation of the ice there came vast outpourings of meltwaters through the spillways in the Guelph and Brantford areas. At the same time large glacial lakes were created. Two of these, Warren and Whittlesey, occupied more or less the same area at different times and are of particular significance to this area. At the time of Lake Whittlesey the present Lake Ontario basin, the Niagara Peninsula, and the eastern portion of the Lake Erie basin were ice-covered. The Huron lobe overlapped the boundaries of the present Huron basin, and the central portion of Western Ontario was dry land. The southward-flowing meltwaters carried immense amounts of sand which were deposited in Lake Whittlesey to form, subsequently, the Norfolk sand plain. A large volume of sand was also deposited later in Lake Warren. As noted previously, portions of some of the moraines were wholly or partially buried by the sands and the sands completely cover, often to considerable depth, the till sheets originally formed by the ice. Where the sand is shallow, imperfect or poor drainage is common.

The sands do not rate highly for dairying or general farming because their inherent fertility is low; because they are often inclined to be droughty; and be-

cause of the low organic content and the rapidity with which nutrients are leached out. When regularly cultivated and not protected they become subject to wind erosion. These soils have, however, proved very suitable for the protection of bright leaf tobacco. So suitable were they that the 1954 crop ranked second in gross value in Ontario after hay and clover. Some 120,800 acres of land were used for this crop, with a production value of $74,174,000. Because of drought, disease and frost, the 1955 crop was smaller. Not all of the crop is grown on the Norfolk plain, of course, but the bulk of it is produced there.

The sands have also been used to advantage for the growth of orchard crops such as peaches and apples. There has been considerable development of this kind along the lakefront in Houghton Township (particularly in peaches), in Charlotteville Township near Walsh and Vittoria, and in Townsend and Woodhouse Townships east of Simcoe. Various other small fruits and vegetables are also grown on the sand and clay plains to supply the factories at Simcoe. The orchard crop production appears to be localized because of a happy climatic factor or because of suitable soil conditions. Many orchards are situated on the transition zone between the sand and the heavier soils. Good drainage with an adequate moisture supply would appear to be important. There seems no doubt that a considerable suitable acreage exists for future expansion.

The soils of the Norfolk plain are generally quite permeable. This, coupled with the more impermeable layer of clay or till at depth, serves to provide the region with an adequate and potable water supply. Much of the sand is shallow over clay or till and farm ponds for various uses are easily made. Indeed, these thousands of acres of shallow sand are often imperfectly or poorly drained and the land is usually not suitable for the production of tobacco and orchard crops in its natural state. Large areas are covered by unimproved bush or scrub or, even if cleared, are often left idle. Some of the land is used to pasture the horses necessary in tobacco harvesting.

The glacial lakes, of which Warren and Whittlesey were most important in this area, persisted for some time and as a result developed wave-cut bluffs, beaches and off-shore bars. These features are like those found along the Lake Erie shore but are often not as well developed. The physiographic map reveals some of the major shorelines. Where the wave-cut materials are stony, boulder terraces may have developed.

There are also many dunes through the area. The more extensive belt-like developments relate to the glacial lakes. One line runs north of Langton and another west of Simcoe. The former, Putnam and Chapman suggest, may be referable to Lake Warren. Dunes are also found elsewhere and some of the smaller developments are no doubt a result of wind erosion since settlement and land clearing. Dunes are rather unstable and consequently are often unsuited to cultivation. They are best covered by trees or permanent grass. Many have been reforested.

Much heavier soils are found in the eastern portion of the watershed and in the area surrounding Port Rowan. Principally these are clay plains but some areas of silt exist, as those to the north of Simcoe. The eastern lands form part of the Haldimand clay plain, all of which was submerged in the waters of Lake Warren. While the till plain of the area previously discussed was covered by deltaic sands to some depth, the till plain of this region accumulated a veneer of heavier sediments. A fair proportion of the heavier soils south from Simcoe to the lake are probably the result of stream erosion stripping the sandy cover.

That part of the watershed east of Simcoe, while containing predominantly heavy soils, is by no means uniform. Although some of the sandy patches are displayed on the map there are a large number of others not shown because of their small size. Often these occur as low knolls or ridges. In many cases they may represent offshore bars developed in Lake Warren. There are, too, cases where the underlying till rises to the surface. Frequently the surface materials are silty. Impeded soil drainage is common. The topsoil tends to be acid and there seems to be a tendency toward the development of a hardpan.

The land use of these areas is similar in many respects to that prevalent on the moraines and the till plain. Dairying is common but cash cropping is of importance for canning and consumer sale. Tomatoes, peas, strawberries, cucumber, pumpkin and cabbage are among the crops to be found. Much of the produce is sent to Simcoe for processing.

The bulk of the area is drained by the Big Creek, Nanticoke Creek and the Lynn River. The former wanders in a shallow valley for some distance in its headwaters region but begins to incise near Teeterville and from there to near the lake occupies a fairly deep and narrow valley. The Lynn system is less well entrenched and the valley itself is more open. Along the lakefront there are a number of small streams, some of which have cut deep valleys. The creek which debouches at Fishers Glen, for example, has cut a valley of 100 feet or more in depth.

Reference to conditions of stream flow shows that after a very dry summer, only those streams originating in or flowing through the sand plain had a permanent flow. The Black Creek branch of Lynn River at the end of August, 1955, was dry or contained only standing pools. It lies almost completely in the clay plain. The Nanticoke Creek is similarly situated but the headwaters lie within the sand plain and there are, in addition, swampy areas and the spring-fed Waterford ponds which contribute a measure of flow.

The present shore bluff has been cut by the waters of Lake Erie and recession is still taking place, usually to the detriment of lakefront landholders. Turkey Point and Long Point, of course, owe their existence to this erosion, the sediments being in part redeposited at these places. Such physiographic development is natural to most shorelines. The lake bluff is generally highest and steepest where the sand plain abuts on the lake. Immediately west of Normandale, for instance, it is up to 150 feet or more high and correspondingly steep. In general the bluff is less prominent where the clay plain reaches the lake. East of Port Dover it becomes comparatively meagre and this is no doubt in part due to the bedrock which begins to outcrop at the lake in this area.

CHAPTER 2

SOIL AND WATER CONSERVATION

1. INTRODUCTION

A partial resources inventory survey of the Big Creek valley was made in 1950 and reports on the findings were subsequently published. Later, a soils, land use and water resources survey was made of the North Creek, one of the tributaries of the Big Creek. Because of the water needs of the town of Delhi, which is served in part by this stream, and the increasing use of its water for irrigation in the production of tobacco, a prime concern of the report was that of water resources.

Since the latter survey was made the Authority has been increased to about twice its original size with the inclusion of a considerable number of streams. A

The sedimentary bed-rocks outcrop in only a few places in the eastern portion of the watershed. In the past they have been quarried to a small extent.

The ground-waters are often highly sulphurous as at this spring near Delhi.

substantial portion of the lands involved possess heavier soils than are found over much of the former Big Creek Watershed. These lands are not suited to the production of bright leaf tobacco, as are the well-drained sandy lands of the Norfolk plain, and there is a much greater emphasis on dairying.

The general pattern of land use is thus somewhat different to that found over much of the sand plain and the problems involved, though similar in many ways, are also different. For this and other reasons it was thought desirable to provide the Authority with a detailed report on a selected area for its consideration and action. This area embraces a small valley, the Upper Black Creek, lying to the east of Simcoe. Most of this watershed lies within the region of heavy soils but a part of it, the western portion in particular, also takes in some sandy soil, much of which is imperfectly or poorly drained and unsuited to tobacco in its present state.

2. SOIL AND WATER CONSERVATION

Conservation of our soil and water resources involves the use of every acre according to its capability and its management according to its need. It does not mean preserving these resources from use but does mean that they should be used wisely according to our present knowledge and needs. Not all land, therefore, is capable of the same use or the same intensity of use. In the Big Creek Region, and in the Upper Black Creek Watershed itself, many acres have been used too intensively in the past and the land has been eroded or exhausted of much of its fertility. Some of this land has been reclaimed to forest or some other use. Conversely, there is land capable of being used more intensively but which is now idle, in poor pasture, in scrub and weeds, or in poor forest.

Each type of land has a range of uses to which it is best suited and of this most farmers are quite cognizant in a general way. That is, they know full well that some crops do well on some lands and poorly on others and that some lands are suited to tractor work and others are not. A fuller understanding of the capability of land is to be gained only by examining it closely from a number of points of view. An examination of this kind was carried out with reference to the Upper Black Creek Watershed.

The land of the Upper Black Creek valley was mapped according to its capability to determine those areas where a change in operation from that prevailing would be fruitful. On the basis of this inventory some recommendations have been made with respect to land management. Where a change in use or management is indicated it may often be carried out quickly and at minimum effort and expense. Frequently simply a change in method is all that is needed to align use and capability. The problem is not always so simple, however, and sometimes the desired change must take place over a longer term and perhaps at some expense and effort.

Where the changes required are reasonably simple they can be carried out in most cases by the farmer himself to his advantage. Those demanding the application of technical experience, a longer period of years to accomplish, or a greater outlay of funds than are at the disposal of the farmer might logically become partially or wholly the Authority's responsibility. At the same time the Authority should, as deemed desirable and possible, aid the farmer in bringing about the changes needed on his farm.

No program of valley improvement can succeed wholly, even in a small valley like that of the Upper Black Creek, unless the people of the watershed give it their full support. They must devote themselves as much to the maintenance and

Dam and pond at Waterford, 1957. On the site of Paul Averill's dam of 1799. The mills (finished by 1800) were below the road. Burned by the Americans in 1814, they were rebuilt several times in the next 120 years.

Robert Quance & Co.'s sawmills on the Sovereign mill site at Delhi — Jacob Sovereign built the first mill here about 1830. Since 1891 these mills have been owned by the Quance family.

Old Electric Power Dam at Croton, south of Delhi. "Mr. Jackson's Mill dam" is mentioned on this site in 1843. H. E. Fisher had saw and grist mills here in 1856. Rebuilt by Quance Bros. in 1873. The power plant was built in 1907 and the dam was washed out in 1937.

improvement of their valley community as they would to any community of which they are part. Every resident of the watershed has a stake in the land, water, wildlife, forest and recreation resources of the area and for his own benefit, if for no other reason, should see to it that these values are maintained or improved.

CHAPTER 3

PHYSICAL LAND CONDITIONS IN THE UPPER BLACK CREEK VALLEY

1. INTRODUCTION

The Black Creek is a major tributary of the Lynn River which it joins at Port Dover a short distance inland from Lake Erie. The section of the valley surveyed lies chiefly to the north of No. 6 Highway and embraces an area of approximately 15,450 acres, or 24.7 square miles. The village of Waterford and the town of Simcoe lie just off the watershed to the north-west and west. The watershed is very nearly rectangular in shape and about 7 miles long from north-west to south-east.

Topographically the region is quite uniform and over wide areas the change in elevation is slight. Along the Galt moraine in the west, however, the land does rise some 50 to 75 feet above the general level to attain an elevation of about 825 feet above sea level.

The plain to the east of the moraine ranges between about 675 feet a.s.l. and 740 feet a.s.l. and is broken by the valleys of the Upper Black Creek and its tributaries. The valleys formed are not deep but are quite marked. Along their slopes erosion is often severe and numerous gullies may be found.

2. PHYSIOGRAPHY

The Upper Black Creek Watershed lies athwart the boundary separating the Norfolk Sand Plain and the Haldimand Clay Plain. The former is a glacial deltaic formation and covers most of Norfolk County and parts of the adjacent counties on the west. The Haldimand plain covers nearly all of the Niagara Peninsula east of a line between Hamilton and Port Dover. The soils of the plain are heavy, relatively stonefree and over wide areas are imperfectly or poorly drained. Chiefly because of a difference in soils the two regions are dominated by different forms of land use. The Upper Black Creek valley is affected by both.

Except in a very general way it is impossible to draw a line separating these two regions. Close examination of the watershed reveals the fact that many islands and peninsulas of sand intrude into the clay plain. Usually these sandy deposits are small in size and occur as a thin veneer over the underlying clay. Soil drainage is often restricted.

The heavy soils themselves are somewhat variable and reflect the mode of deposition. The surface materials are chiefly lacustrine, the mark of glacial Lake Warren which covered the area, but the heavy tills are never too deeply covered and come to the surface here and there, particularly in the north. Sometimes silty deposits may be found but these are of small extent. Although the soils are by no means stony, bouldery deposits may be found on the plain in the northern reaches of the watershed. These were presumably deposited by the ice and many of them are granitic.

The soils also tend to be stonier along the edge of the Galt moraine. The stones are a product of Warren beach development. The moraine itself is quite sandy and much smoother than most moraines. It has been covered very largely by sandy outwash.

The limestone bedrock is of relative unimportance in this area although it does come to the surface in the east in stream beds. In several places the rock has been quarried in the past. The effect of the bedrock on land use is minor but it would, no doubt, have some importance in dam construction. The relation of the bedrock to water supplies was not examined. Most of the wells are fairly shallow and the water appears to be quite satisfactory for domestic use.

One other feature of the watershed might be mentioned. To the north of Renton is to be found a ridge of sand partly windblown and now largely reforested. This ridge is considered to be a sand dune formed at the time of Lake Warren. After being cleared of trees it became open to wind erosion and this has largely been corrected by returning it to trees. This is its best use.

3. SOIL CONDITIONS IN THE WATERSHED

As has already been mentioned there are two broad classes of soils in the watershed and this fact, combined with climatic and other conditions, has had considerable influence on the type of land use. There are, on the one hand, the sandy and rather gravel-free materials which have been used for tobacco and orchard crops, and on the other, heavy clays and tills which have been used chiefly for dairy and general farm production. In both cases land uses overlap to some extent.

(a) *The Soil Profile*

If the soil in a long-established woodlot or an old fenceline is examined closely, it will be found that it is composed of layers, or HORIZONS. Each horizon has distinct characteristics of colour, texture, structure, organic content, acidity and clay content which serve to separate it from the others in the PROFILE, as the vertical section through the soil from the surface to the parent material is called. Each soil has a characteristic profile and it is possible to classify and map soils as to groups and types.

Most well drained soils in Southern Ontario belong to a great group of soils known as Grey-Brown Podzolics and they possess three distinct horizons designated as the A (the topsoil), the B (the subsoil), and the C (the parent material). The poorly drained mineral soils belong to the group known as the Dark Grey Gleysolic and these have a glei horizon, bluish-grey to olive in colour and rather sticky and compact, in place of the B horizon. There are also the organic soils, the peats and mucks. All these groups are represented in the Upper Black Creek Watershed.

A group of soils developed on similar parent materials in the same region but differing in profile development because of surface relief or drainage is called a CATENA. Within a catena there may thus occur well drained, imperfectly drained and poorly drained members. Each member is designated as a SERIES and the catena usually takes its name from the well drained member. The series is broken down into TYPES based chiefly on the texture of the surface soil. Thus, in the Upper Black Creek valley there is the Fox catena with the Fox, Brady and Granby series representing the well, imperfectly and poorly drained members. The first two are Grey-Brown Podzolic soils while the latter belongs to the Dark Grey Gleysolic Group.

The following profile description is typical of a well drained soil in Southern Ontario.

HORIZON

A_0 — Decayed vegetation

A_1 — Dark brown or gray material—loose, friable, containing humus and mineral material. Slightly acid in reaction.

A_2 — The leached horizon has no humus. The iron, lime, organic matter and clay have been washed out. Light gray to yellow in colour and dusty in texture. Acid in reaction.

B — This is the zone of deposition in which the materials washed or leached from the A_2 accumulate. May be acid to slightly alkaline in reaction. Brown colour and blocky or nutlike structure. Free lime carbonates are found at the bottom of the B horizon.

C — This is the unweathered parent material. The colour is grayish, and there is no structure as in the B. Free lime carbonates are found.

The A_1 horizon of a soil with restricted drainage is normally thicker than in the well drained soil although the profile itself may be shallower. Also, the A_2 horizon may be less well developed. Soils suffering restricted internal drainage are marked by rust-coloured streaks and blotches in the lower horizons. Where poor drainage prevails the subsoil may be blue-gray to olive in colour, in contrast to the rich browns of the well drained soils.

(b) *The Watershed Soils*

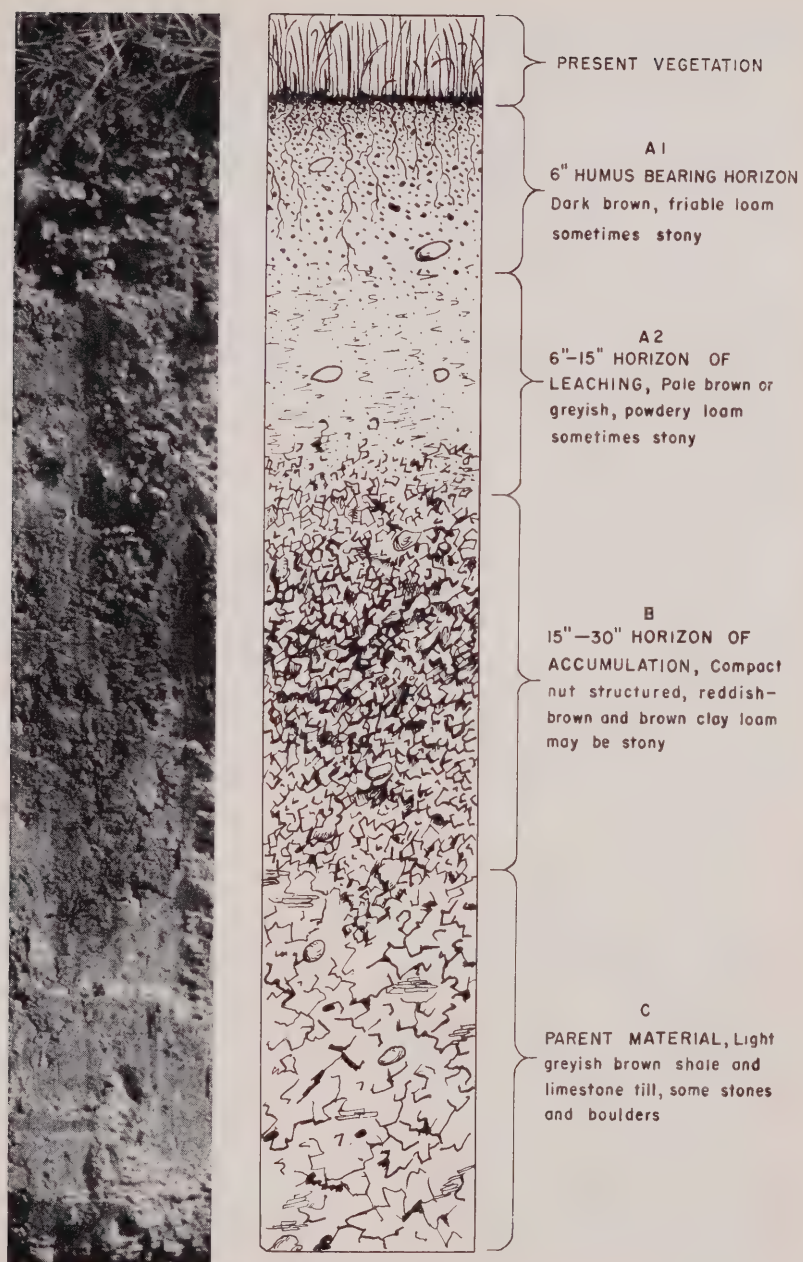
Not all soils have the same capability, even though they may be topographically similar and superficially appear the same. The designation of land according to its capability and recommendations as to its use and management demand that the various soils be mapped as to type. The present state of erosion, susceptibility of the soil to erosion and surface slope are among the factors which must be considered.

For ordinary farm crops the sandy soils of the watershed range from fair to poor in adaptability but for some crops, such as tobacco and orchard crops, the well drained sands are quite suitable. Tobacco production is restricted to this kind of soil.

The well drained sands belong almost entirely to the Fox catena but a small acreage of Bookton and Plainfield is to be found. The first mentioned soil exhibits a well developed profile with a good structural B horizon. The soil is acid in reaction and deficient in potassium and phosphate but it responds well to adequate additions of commercial fertilizer. The imperfectly and poorly drained associates of the Fox are devoted to pasture and woodlot. The acreage of both series is limited.

The Plainfield sand is very restricted in area and almost entirely forested. Under previous management this soil suffered from wind erosion and drifted badly. It is now in its best use. The soil suffers excessive internal drainage and the B horizon is either lacking or chromatic only.

The Bookton catena is represented almost entirely by the Berrien and Wauseon series and the distribution of both is fairly widespread. Large areas of the poorly drained Wauseon are found adjacent to the moraine and the land is chiefly in woodlot. The imperfectly drained Berrien may produce comparatively good crops, particularly in a dry year and if adequately fertilized. These soils are formed in a



Profile of a representative grey-brown podzolic soil.

well sorted outwash which is found as a veneer of a few inches to two or three feet over clay till. Some of the underlying clay is lacustrine.

The Berrien sandy loam in particular is often found in widely scattered patches of small size. The effect on land use is negligible and the pockets and knolls are cultivated and cropped like the rest of the field. Although imperfect drainage prevails the profile of this soil is quite well developed.

The heavy soils of the watershed have developed in the veneer of lacustrine materials over the heavy tills. In places where the tills come to the surface, somewhat different soils have developed. Throughout the region, however, imperfect or poor drainage is a persistent factor influencing land use and affecting yields and crop quality. Except for the river valleys the land is almost everywhere level or very gently rolling and sheet wash has not been important. Depletion of the organic content of the soil has sometimes been more serious.

A major soil of the plain, in terms of area, is the imperfectly drained Haldimand clay loam, a stiff clay soil that bakes to a hard mass in a dry summer. This is accentuated where the soil organic content has been reduced. In some places there appears to be a tendency for the development of an indurated B horizon, presumably the outcome of restricted drainage and a very slow natural erosion process. The combination of a stiff soil and restricted drainage at times results in poor crop growth, particularly during a dry summer. In part this is because the plants produce a shallow root system in spring because of a high water table and later are unable to send roots deep enough as the water table drops. We thus have a crop suffering from drought in an imperfectly drained soil. This situation is by no means uncommon and adequate soil drainage is usually a cure for it. Perhaps chiefly as a result of the level terrain and the very slow rate of natural erosion this soil is particularly deficient in lime and phosphorus.

This heavy land is used primarily for the production of animals and animal products. Some beef cattle are maintained within the watershed but the emphasis is on dairy production. The production of hay, pasture, corn and feed grain is therefore favoured. Nevertheless, some of the heavy land is devoted also to orchard crops, principally apples, and market crops for canning and fresh sale.

(c) *Soil Erosion*

Roughly 80 per cent of the lands drained by the Upper Black Creek have been affected only to a minor degree by wind and water erosion. This is so chiefly because so much of the land is nearly level to gently sloping. Where the land is more steeply sloping, as along the streams, erosion has been more severe. Particularly is this true where these slopes are cultivated or grazed in excess of their capacity.

Gullies have developed in numerous places along the various stream banks. Fortunately most of them are as yet small. Action should be taken to control them before they increase in size. In heavy soils such as those found in this area gullies, once started, can become a serious problem and difficult to control if let get out of hand. At a number of points there is an urgent need for waterway control and this can be achieved best by grassing permanently the channels in question. Gullies are only part of the story, however, for most of the erosion has resulted from sheet wash on the gentle and steep slopes and on the knolls. Some of these lands can only suffer further deterioration unless adequately cared for. Where the measure is indicated the land should be removed from agricultural use entirely and reforested. In other cases a permanent grass cover and controlled grazing will solve the

problem. On yet other land infrequent cultivation to grain and an emphasis on grass will do the job.

The following table outlines the sheet erosion situation on the watershed.

SHEET EROSION CONDITIONS ON THE UPPER BLACK CREEK WATERSHED

Degree of Erosion	Acreage	Per Cent	
0	1,199	7.6	
1	11,423	73.8	
2	1,457	9.3	
3	342	2.1	
4	132	.9	
5	180	1.1	94.8
Bottomland	759	4.8	
Muck	56	.4	5.2
Totals	15,450		100.0

Degrees of Sheet Erosion

0—No significant erosion.
1—Less than ⅓ topsoil removed.
2—⅓—⅔ topsoil removed.
3—⅔ topsoil and less than ⅓ subsoil removed.
4—All topsoil and less than ⅔ subsoil removed.
5—All topsoil and more than ⅔ subsoil removed. Erosion usually into parent material.

CHAPTER 4

PRESENT LAND USE

The watershed is practically devoid of any industrial or urban development and except under very special circumstances the area is likely to remain almost completely agricultural for a long time to come. The lack of any resources apart from those of the soil, an inadequate water supply, and the general location would seem to preclude any such development. The future prospects of the region should therefore be considered primarily in terms of agriculture and steps should be taken now to preserve and improve the base on which this type of economy will rest.

The bulk of the land in the watershed is devoted to the production of feed crops. More than one third of the total acreage produces hay or pasture, either improved or unimproved, and almost one third is used to grow feed grains and corn. Of the remaining land a considerable proportion is devoted to the production of a number of horticultural crops, while a considerable acreage is covered by forest. Some fine woodlots do exist but most of the woodland is of indifferent quality.

The economy of the area depends primarily on the production and sale of animals and animal products. Dairy production is highly important and a field check of the cattle population revealed that dairy breeds were favoured over beef breeds in the ratio of 14 to 1. Beef production is not an important enterprise. No data were gathered concerning other farm livestock. It should be noted, however, that several farmers have entered the poultry and turkey business on a commercial scale. There is prospect of further development in these lines as our population expands. In addition, there is one mink and fox ranch on the watershed, but this can be considered as a form of agriculture only in a loose sort of way.

A small acreage is devoted to the production of special crops. In some cases the production of these crops forms the whole of the farm enterprise and in others is a lucrative but secondary source of income. Tobacco, orchard crops (chiefly apples) and some truck crops are full-time endeavours for a number of growers. The market crops are varied and include such things as cucumbers, potatoes, strawberries, gladioli, cabbages, pumpkins, peas, grapes, peppers, tomatoes and cauliflowers. Table and seed corn are also grown. The bulk of the vegetable production goes to Simcoe or Waterford for processing but some finds its way into the fresh market.

Most of these special crops are grown on the western side of the watershed on the better drained sandy lands or on the fringe of these lands. In the case of tobacco, location on these soils is mandatory. The other crops are not so selective in their requirements and the soils used vary from the sandier types to those where the clay fraction is fairly high. Imperfect soil drainage seems to be a relatively minor hindrance in the production of these crops although wet years would cause trouble where artificial drainage works do not exist.

The balance of the productive land in the watershed is in forest. Most of it is best suited to this use and should so remain. In the majority of cases, however, the present stands could be improved considerably through thinning, removing of diseased trees, selective cutting, and a restriction on pasturing. Although some land has been reforested, a moderate acreage still exists where, because of steep slopes and severe erosion, this treatment would be desirable. There is, in addition, some scrub land on the watershed which provides only the roughest and least economic form of pasture. Land like this should either be treated to provide better pasture or fenced and managed for productive woodland.

There are approximately 270 separate land holdings on the watershed where agriculture is the basic use. Of these 270 holdings, about 57 per cent are smaller than 50 acres in size and nearly 28 per cent are less than 25 acres in size. Fragmentation like this is typical of areas where horticulture and special crop production is important. It should be noted, however, that many of the holdings of close to 50 acres are devoted to general farming.

The majority of holdings over 50 acres embrace about 100 acres of land and almost without exception these are devoted to dairying and general farming. There are only a few farms larger than this and none exceeds 200 acres in size.

There are few farm ponds in the area, although it would seem they could be used to good advantage for stock watering and irrigation. The value of irrigation is appreciated by most of the tobacco, tree crop and vegetable growers, and there has already been some disquieting competition for stream water supplies. These supplies are severely limited, however, particularly in dry years, and over-use would have a detrimental effect on stream flow. A partial solution to the problem may be found in the farm pond. Of these, the dug-out, run-off and permanent

The extensive, imperfectly drained, level clay lands suffer little from erosion but require drainage and fertility maintenance to produce good crops.

Tobacco is the major crop of the loamy and well drained sandy lands. The typical 2-year rotation of rye and tobacco is shown here.

stream types would appear to have most application. The regulation of permanent streams by dams by riparian owners is not a matter which may be left completely to the discretion of these owners. Under the Statutes of the Province of Ontario it is unlawful to dam a permanent stream without first securing permission from the Surveyor-General, which means that a plan must be filed in his office.

The following table summarizes the land uses found during the survey.

PRESENT LAND USE

Use		Acres		Per Cent
Hay			2,465	15.9
Pasture			3,046	19.7
Grain			3,182	20.6
	Oats	1,556		
	Wheat	1,109		
	Mixed	259		
	Rye	178		
	Buckwheat	80		
Corn			1,971	12.8
Horticultural Crops			1,401	9.1
Forest			2,070	13.4
	Not pastured	883		
	Pastured	921		
	Scrub	120		
	Plantation	146		
Orchards			377	2.4
Idle			569	3.7
Buildings and Urban			354	2.3
Miscellaneous			15	.1
Total			15,450	100.0

CHAPTER 5

LAND CAPABILITY AND RECOMMENDED LAND USE

1. LAND CAPABILITY

Before the land of a watershed can be planned for the purposes of soil and water conservation, it must first be surveyed to determine its use capability and then classified accordingly. The system of classification used is similar to that used by the Department of Soils, Ontario Agricultural College, in the planning of farms.

In classifying the lands of the watershed, several questions were kept in mind: (a) Was the land suited to the type of agriculture prevailing and if so, could it be tilled without the risk of erosion? (b) If erosion was a restricting factor, how great a risk was entailed in devoting the land to continual cultivation? (c) Was the safe use of the land limited to the production of permanent vegetation and if so, should the cover be grass or forest? (d) What was the position respecting soil drainage? (e) To achieve minimum risk should the land be cultivated only part of the time?

In assessing the suitability of a piece of land for agricultural use, the piece of land in question is rated according to one of the four following categories:

A—Suitable for cultivation

B—Suitable for only occasional cultivation

C—Suitable only for permanent vegetation and unsuitable for cultivation

D—Not suitable for cultivation or for commercial grazing or forestry.

Within these broad categories various classes of land are recognized.

A—Suitable for Cultivation

Class I —Without any special practices over and above what is considered to be good farming for the area. This land may be continuously cultivated with safety and will produce good crops for an indefinite period.

Class II —Requires moderate restrictions in use and more specialized conservation practices to produce good yields with minimum risk to the land.

Class III —Needs intensive restrictions in use to provide good crops on a sustained production basis with minimum risk to the land.

B—Suitable only for Occasional Cultivation

Class IV —Best used for permanent vegetation but may be safely cultivated occasionally to certain crops.

C—Suitable only for Permanent Vegetation

Class V —Normally uncultivable because of restricted drainage and is best suited to permanent vegetation. No special practices or restrictions are required.

Class VI —Requires moderate restrictions in use.

Class VII —Needs severe restrictions in use.

D—Not Suited to Cultivation or Commercial Grazing or Forestry

Class VIII—Includes areas of rock outcrop or marsh which do not lend themselves to cultivation or commercial grazing or forestry.

2. RECOMMENDED LAND USE ACCORDING TO USE CAPABILITY

The land use capability classes may be converted into classes of recommended use by indicating which special practices and restrictions are required for each type. The recommended classes are indicated by adding the symbols C, R or D to capability classes II and III and T or P to class IV. On classes V, VI and VII, recommendations are given as needed. No special practices are required on class I land and normally no restrictions are placed on use.

The symbol C is applied to land where the capability has been reduced by erosion which can be corrected by mechanical means such as contour tillage, diversion terraces, strip-cropping or buffer strips. Some land susceptible to erosion but capable of being farmed using these methods is also placed in this class.

Land whose surface varies from level to sloping but which is unsuited to contour tillage, although subject to erosion, drought or fertility depletion, may be placed in class R. Hummocky land is usually placed in this category. Vegetative methods of control such as rotations, winter cover crops and soil-building crops are indicated.

Wet land whose productivity can be improved through artificial drainage with minimum difficulty and expense is indicated by the letter D. Class III D requires more intensive application than class II D.

Class IV land may be land too rough or eroded to be put under regular rotation and is indicated as IV T. Land which is too wet for regular rotations and on which artificial drainage is not feasible because of lack of outlet or the expense involved in providing one is classed as IV P. Normally suited only to pasture or forest, land of this class may, however, be cultivated and cropped in a dry year. Class IV P land differs from class V land in that it is not subject to periodic stream inundation.

Land Class I

Because of restrictions of one kind or another, including restricted drainage, depletion of soil fertility and structure, and erosion, no class I land was mapped in the watershed.

Land Class II C

As may be seen from the table, only a small acreage has been designated as class II C land. The slopes of this type range from 2 to 6 per cent, are smooth, and are suited to contour cultivation methods. Strip cropping, diversion terraces and grassed waterways find application on this land.

Land Class II R

This land class includes hummocky land with slopes ranging from 2 to 7 per cent and smoothly sloping land which is broken by watercourses to the extent that contour cultivation would be impractical. The acreage of this land is considerable and amounts to over 9 per cent of the watershed.

Erosion is mild to moderate and may be controlled by good rotations, the use of winter cover crops and the restriction of intertilled crops on the more steeply sloping land.

Land Class II D

Nearly ¼ of the watershed has been designated as class II D. The chief hazard to crop production on this level to gently sloping and nearly erosion-free land is that of restricted drainage. Outlets are available and artificial drainage of this land may be achieved fairly easily. Some of the land has already been so treated. Adequate drainage helps to reduce frost heaving of the crops, prevents crop drowning, and enables the farmer to enter on the land earlier in spring.

Land Class III C

A very minor acreage—less than 1 per cent of the whole—has been classed as III C. The slopes of this type are smooth and range from 6 to 10 per cent. In some cases gently sloping but more severely eroded land has been included.

Land Class III R

Nearly 4 per cent of the watershed area has been classed as III R land. Like the II R the nature of the land is such that contour methods of cultivation are impractical. As with land classes IV T, VI and VII, most of the type is found along the stream valleys where dissection has resulted in rougher topography.

The slopes are somewhat steeper than on II R land and erosion is often more of a problem. In some cases less rugged land which has been more severely eroded has been placed in this class. Also, some phases of what normally would be considered class III land have been placed in class IV because of severe erosion.

Intensive restrictions in use are required to prevent more serious erosion and fertility depletion on this land. The use of longer rotations and the growing of soil-building grasses and legumes are indicated.

Land Class III D

This land class is associated almost entirely with the heavy soils of the watershed. The land is level to gently sloping and erosion is not a problem even under fairly intensive use.

The restricted soil drainage is more severe than in class II D and may be overcome by the installation of ditches or tile underdrainage. A considerable amount of both already exist. When adequately drained and properly managed these soils are quite productive. In the southern portion of the watershed particularly, these soils tend to be deficient in organic material and low in phosphates. Applications of lime may often be beneficial in correcting acid soil conditions where these exist.

Land Class IV T

Land of this class is located chiefly along the streams and should be restricted from regular cultivation because of rough topography and susceptibility of the soil to erosion. In numerous places erosion is already quite severe. The land is not generally good for tractor work.

The class involves about 5 per cent of the watershed and is best placed under a permanent grass cover with controlled grazing. Cultivation for pasture renewal may be done occasionally with reasonable safety. The occasional grain crop may also be grown.

Land Class IV P

The acreage defined as class IV P is confined to those wet areas which cannot be drained economically. Erosion is negligible and in a dry year, with a lower water table, a satisfactory crop may be taken off. Where the land has not been cleared the forest should be left and improved.

Land Class V

This type includes those areas subject to periodic flooding, chiefly the flat lands of the valleys adjacent to the streams. It includes the small muck areas found within the watershed. By and large the land is clear and devoted to permanent unimproved pasture. In some places a tree cover prevails and should remain. The benefits to be gained by clearing would be offset by the cost of so doing.

The chief hazard to use is that of poor drainage combined with periodic flooding. In addition the land is cut up by the streams to the extent that cultivation is difficult or impossible. Normally the land requires no special conservation practices apart from woodlot protection and pasture management. Also, more consideration should be given to stream and stream-bank protection. It should be

noted that the class, as outlined on the map of recommended use, may contain small areas of what would normally be considered as class VI or class VII land. The scale of mapping has demanded that these areas be included as class V.

Land Classes VI and VII

Taken together these lands make up over 7 per cent of the watershed. Both types are found along the valley slopes and the land is rough and steeply sloping. Severe sheet erosion and gully wash are often a problem.

The distinction between the two classes is one of degree rather than kind, the designation VII meaning that control of use should be more severe than on class VI land.

Because of the erosion hazard and difficulty of working, neither class should be regularly cultivated. If left in pasture, grazing should be restricted. In many cases, where woodlots are not already present, reforestation would be the best practice.

Land Class VIII

There is no class VIII land in the watershed.

RECOMMENDED LAND USE

Land Class	Acres	Per Cent
I	None mapped	None mapped
II C	220	1.4
II R	1,443	9.3
II D	3,804	24.5
III C	118	.8
III R	444	2.9
III D	5,932	38.5
IV T	812	5.3
IV P	586	3.8
V	921	6.0
VI	797	5.2
VII	363	2.3
	15,450	100.0

CHAPTER 6

FARM PLANNING

To most farmers the idea of planning is not new; in some measure or other they plan the use and management of their land so that they know a year or so in advance what cultivation sequence they are going to follow. They plan for repairs to buildings, equipment, fences and so on. They plan so far as they can the day-to-day and month-to-month work they are going to do, and much of it becomes routine. Planning, in short, is an essential feature in the life of the farmer as it is with anyone concerned about his future.

Although many farmers have a plan regarding the use to which they put certain or all of their fields, relatively few have had their farms planned so that the maximum use, consistent with the best use, is made of each piece of land. The object of a plan of this sort is to enable the farmer to get the most out of his land and at the same time to do it in such a manner that no damage to the land occurs. When a farm is planned each piece of land is judged according to its capability to produce, and various use recommendations are made. They may include pasture management, crop rotations to follow, woodlot management and reforestation, farm drainage, fenceline removal or relocation, or any other works and practices which would benefit the farmer and his land.

Planning does NOT need to be so rigid that there is only ONE recommended use or management for a piece of land of one class. Alternative recommendations may be made for a piece of land in a certain class. The first rule is to apply the easiest and cheapest remedy. The next thing that determines the choice of use is the relation of the field to the rest of the farm. Other factors apply, such as suitability for using powered mechanized equipment, or the distance from the barn and ease of access. The final determination depends on the crops and animals the farmer chooses to carry. The final plan, therefore, is the end result of a good many compromises and at each stage of preparing the plan certain choices have to be made.

In this section an actual farm plan is presented, prepared by the Soil Advisory Service of the Soils Department of the Ontario Agricultural College. The soils are typical of those found over much of the watershed.

In developing the plan a farm planner goes over the farm field by field and maps the soils as he finds them. He uses an aerial photograph as a base map. The soil series and types are identified and an estimation of the degree of erosion is made by examining vertical sections of the soil. The slope of the land is measured, using a hand level which gives slope as a percentage. A rise of four feet in a run of one hundred feet, for example, is a 4 per cent slope.

The occurrence of watercourses, either permanent or intermittent, with or without a definite channel, is noted, as are fencelines, stonepiles, springs, seepage areas, gullies or any other items of importance.

All of the information gathered is marked on the map, using symbols, and each piece of land of the same type with respect to soil, slope and erosion is delimited by a boundary line.

From the map of soil type and conditions a map of use capability is prepared. Each piece of land is assigned to one of eight capability classes. These classes are the same as those used for the watershed and are included here as part of the plan. On any one farm not all classes will necessarily be found.

The plan of the farm is then worked out with the farmer so that each field, or each piece of land, is put as nearly as is practicable to the use which fits the capability. Any systems of tillage or cropping or special practices to control erosion and water loss are applied where necessary. The fields and rotations are worked out so that there is the correct balance of pasture, fodder and grain to meet the requirements of the herd which the land can carry.

Before the planned rotations are put into effect it may be necessary to arrange a transition period in which the change-over from present cropping to the planned rotation is made without losing a year of cropping. Also, it may take a year or two to get special devices like grassed waterways and terraces in working shape. A time of transition such as this may also prove useful in providing a period during

MAPPING SYMBOLS USED IN FARM PLANNING

MAPPING SYMBOL (EXAMPLE)

582 sl — Soil Type
3B1 — Degree of Erosion
Slope Group
Per cent Slope

SOIL TYPES ON YOUR FARM

582 s - Fox sand
582 sl - Fox sandy loam
584 sl - Brady sandy loam
586 sl - Granby sandy loam
284 l - London loam

SLOPE GROUPS

UNIFORM SLOPES

A – 0 - 2	*per cent*	E – 15 - 20	*per cent*
B – 2 - 6	" "	F – 20 - 30	" "
C – 6 - 10	" "	G – 30+	" "
D – 10 - 15	" "		

IRREGULAR (HUMMOCKY) SLOPES

M – 0 - 7 *per cent*
N – 7 - 15 " "
P – 15 - 25 " "
R – 25+ " "

DEGREE OF EROSION

WIND AND WATER EROSION

0 – No noticeable erosion
1 – Up to $\frac{1}{2}$ of the "A" horizon removed by erosion.
2 – Some "B" horizon material in the cultivated layer.
3 – Some "C" horizon material in the cultivated layer.
4 – Gullies too deep and too frequent for the land to be cultivated.
+ – Accumulation of eroded materials.

INDIVIDUAL GULLIES

Shallow
Into subsoil
Into parent material

STONINESS

0 – No stone
1 – A few stones but not sufficient to interfere with cultivation.
2 – Sufficient stone to be a nuisance to cultivation but land can be used for regular rotation.
3 – Too much stone for cultivation but land suitable for pasture.
4 – Too much stone to be used for pasture but suitable for trees.

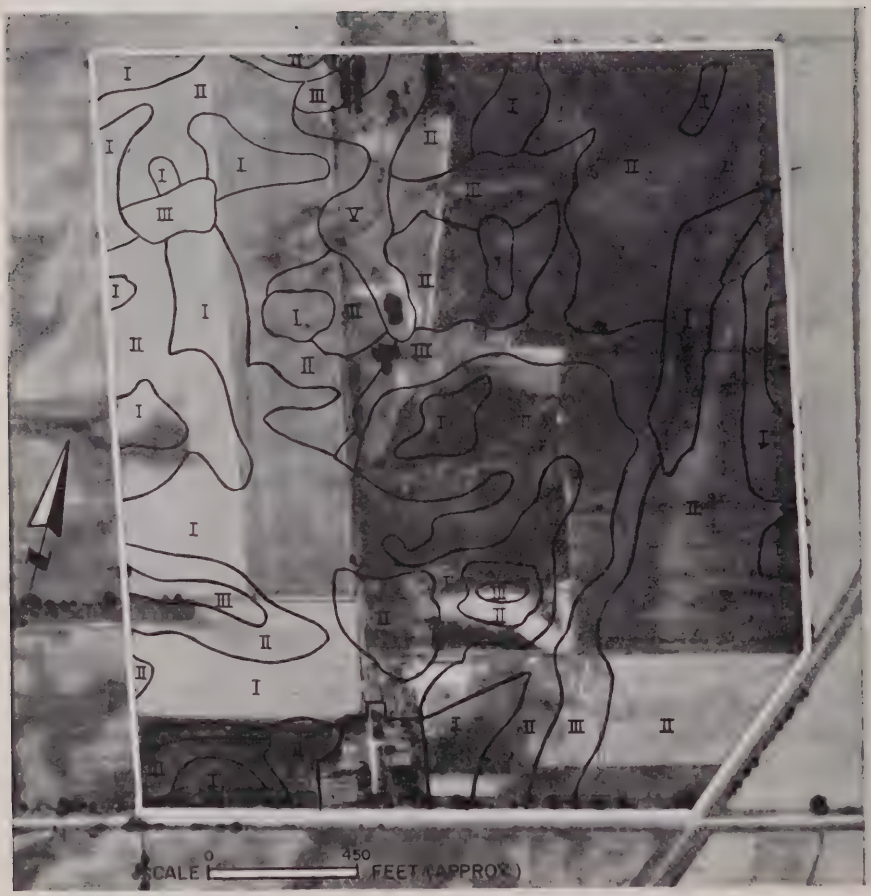
WATERCOURSES

Permanent streams
Intermittent streams
Spring
Sod waterway
Proposed tile

SOILS DEPARTMENT, ONTARIO AGRICULTURAL COLLEGE, GUELPH, ONTARIO.

SOIL, SLOPE AND EROSION

LAND USE CAPABILITY



FARM PLAN


6.5 Ac.
WOODLOT or PASTURE
POND
1
16.0 Ac.
2
17.0 Ac.
3
14.0 Ac.
4
16.0 Ac.
5
14.0 Ac.
LONG TERM PASTURE
6
10.0 Ac.
SCALE
0
450
FEET (APPROX.)

which any desired changes in the plan may be made.

In adjusting use to capability it may not be possible to outline fields exactly according to natural soil conditions. The inclusion of a small area of Class II land in a field which is predominantly Class I land may mean that this small area of land of lower capability will be worked as intensively as the Class I land. This is not strictly following the principle of "using each acre according to its ability", but is a compromise weighed against the possible cost of fence removal, difficulties of tillage and so on. In a plan, therefore, there may be found one or more small areas of one land class within a larger area of another land class.

The recommendations made by the planners are sensible and as often as not can be implemented at little or no cost. Sometimes a more substantial outlay is required to bring the use of the land, and the manner of its use, in line with its capability. The success of the venture, of course, depends very largely on the enthusiasm of the individual farmer and each step taken should be integrated into the farm business.

FARM PLAN

Objectives

The following plan for the use of the land on your farm is designed to:

(a) be a practical working unit.

(b) use the land according to its capability without serious deterioration.

(c) maintain the soil at an economically high level of productivity.

(d) produce an approximately equal acreage of each crop each year.

(e) minimize soil and water losses.

In preparing the plan the following procedure is followed. First, the soil, slope and erosion are mapped on an aerial photograph. Second, the capability for agricultural use is then worked out on the basis of type of soil, stoniness, drainage, steepness of slope and the tendency of the soil to erode. Third, in co-operation with the farmer the farm layout and crop rotations are worked out on the basis of the land-use-capability units.

Suggested cultural, management and fertility practices are outlined. The location and acreage of any crop in any year is readily found by referring to the cropping schedule.

Discussions on cropland, permanent pastures and woodlots should be supplemented by material found in various bulletins dealing with the different subjects. The material found in such publications is based on years of experience and experimental work and should be adapted to your farm in so far as is practical and applicable.

Lands Which May Be Cultivated

CLASS I

Class I land is suitable for cultivation without special conservation measures. It must be nearly level, workable, productive, well-drained and not subject to erosion or overflow. This land requires the addition of plant foods that are used by crops or lost by leaching. These plant foods are returned by barnyard manure, green manure crops or commercial fertilizers. Crop rotations to assist in maintaining the productivity are recommended.

CLASS II

Class II land is suitable for permanent cultivation with some simple practices often required. Chief types of practices are erosion control, water conservation, correction of moderately low fertility and the removal of boulders. The practices to conserve soil and water include contour cultivation and strip cropping with crop rotations that include legumes and grasses. The various sets or combination of practices must always be practical and useful in maintaining soil productivity.

CLASS III

Class III land is suitable for permanent cultivation with intensive conservation measures. This land requires careful and intensive application of practices to conserve soil and water. The type of practices are similar to those applied on Class II land but their use must be more intensive and widespread. Class III land requires longer rotations of legumes and grasses, cropping in narrower strips, buffer strips, grassed waterways, diversion ditches and greater use of cover crops. Class III land is generally characterized by one or more of the following features: steeper slopes, greater degree of erosion, lower fertility or handicapped by stones, boulders and poor drainage. This land requires additional treatments to maintain the soil at adequate fertility levels for the production of moderate to high yields of good quality crops.

CLASS IV

Class IV land is suitable for occasional or limited cultivation. This land is generally handicapped by one or more of the following: steeper, more severely eroded, more susceptible to erosion, more difficult to drain, less fertile, droughty or restricted in use by stones, boulders, or scrub tree growth. The types of conservation measures applied to this class aim at removing, in so far as possible, the limiting features. To reduce soil losses and conserve rainfall on the steeper slopes, five- to six-year rotations consisting of one year grain and the rest in clovers and grasses are frequently used. Class IV land may be set aside as a pastured area to be broken up and reseeded every fifth or sixth year.

Lands Which Should Be Kept in Grass or Trees

CLASS V

Class V land is not suitable for cultivation but is suitable for a permanent vegetation that may be used for grazing or woodland. This land is not subject to erosion but is generally too wet or stony for cultivation.

CLASS VI

Class VI land is suitable for permanent vegetation that may be used for restricted grazing or woodlot. Most of the land is moderately eroded or steep droughty soils of low fertility. When used for grazing such restrictions as carrying capacity, deferred grazing and rotation of grazing must be practised.

CLASS VII

Class VII land is not suitable for cultivation and requires severe restrictions if used for grazing. Pastures generally require liberal applications of fertilizers and careful regulation of the grazing. A large part of this land should be reforested or kept in woodlot and fenced from livestock. Most of the land in Class VII is steep, rough, eroded and highly susceptible to erosion.

CLASS VIII

Class VIII land is not suitable for cultivation or the production of permanent vegetation. The land is chiefly rough, extremely stony barren land or swamps and marshes that are permanently wet and cannot be drained.

CROPPING PLAN

Field No.	*Acreage*	*1*	*2*	*3*	*4*	*5*
1	16.0	Corn	Pot.	H	H	H
2	17.0	H	Corn	Pot.	H	H
3	14.0	Pot.	H	H	H	Corn
4	16.0	H	H	Corn	Pot.	H
5	14.0	H	H	H	Corn	Pot.
6	10.0	Long-Term Pasture				

Potatoes (pot.)	14.0	16.0	17.0	16.0	14.0
Corn	16.0	17.0	16.0	14.0	14.0
Hay (H)	47.0	44.0	44.0	47.0	49.0
Cropland	77.0				
Pasture	10.0				
Homestead and Lanes	2.0				
Woodlot	6.5				
Total Acreage	95.5 ac. (approx.)				

The objectives of this farm plan were to arrange a definite cropping program, and to increase the production while trying to maintain soil productivity at an economically high level. The land was mostly a sandy loam soil, with a few areas of clay loam.

In making up the new plan, the type of farming was kept in mind, that is potatoes, corn, and hay or pasture in rotation. The fields were rearranged to be as convenient as possible to the buildings and to give a balanced rotation of these crops. One field near the buildings was put in long-term pasture, and permanently fenced. The only other fences are around the woodlot and the one straight back through the farm where the lane used to go. As this farm needed a large proportion of sod for hay and pasture, it didn't need a general soil build-up plan as much as it needed an organized cropping system.

A fertility program was discussed with the farmer, the main requirements for additional commercial fertilizer being recommended from soil samples that were tested at the Soils Laboratory. The proper handling of manure and crop residue was also introduced into this farming system.

Although the farm is not hilly, and the cropping system isn't conducive to erosion, nevertheless, there were some gullies and soil erosion resulting from the past cropping system. Grassed waterways were recommended where these gullies demanded it, and the new rotation will cut the soil erosion on the slopes down to a minimum.

Runoff channels like this one should be left permanently in grass.

Gullies are fairly common in the watershed and steps should be taken to control them.

CHAPTER 7

RECOMMENDATIONS

The study of Upper Black Creek reveals that a number of things might be done to improve the general land use picture of this valley. Most of the improvements can and should be carried out by the individual farmer but there are some which may be beyond the individual's financial or technical capabilities. In these instances there is a public interest which might be fulfilled through participation by the Conservation Authority. At times this participation may be limited to technical assistance; at other times more tangible and direct assistance may be needed.

Members of the farm community are sometimes unaware of the considerable assistance available to them in the solution of their difficulties and problems in relation to the farm enterprise. This aid may be provided by the Conservation Authority, Agricultural Representative, Zone Forester, and the local municipal council. Often commercial agencies working in agriculture and supplying farm needs can provide advice in specific cases. The Conservation Authority can provide a beneficial service through publicizing the sources and kind of aid which farmers may receive, by assisting in the solution of individual problems where this seems desirable, and by setting up demonstrations of good land use practices and control measures.

As suggested above, most of the land use improvements may be carried out by the individual farmer. These practices are fairly numerous but not all of them will necessarily be useful or desirable on any one farm. The need for any or all of these measures will be indicated in a farm plan and it is recommended that the Authority, with the advice and assistance of the Agricultural Representative, promote land use planning on each farm in the valley.

Conservation practices which would find particular application and value in the valley include gully control, farm ponds, grassed waterways, private reforestation, pasture improvement, farm drainage, stream channel control, crop rotations, and mulching and weed control. Brief comments on some of these follow. The order does not mean to suggest relative importance.

(a) GULLY CONTROL

Gullies develop for many reasons but probably the principal cause is the accelerated run-off produced by uncontrolled grazing of grasslands and imperfect methods of cultivation. Land cultivated and put to crop should be protected from excessive run-off and gully erosion through the use of grassed waterways, through contour cultivation and strip cropping where possible, and by maintaining the tilth and absorbency of the soil.

Where gullies have already developed their renovation may be difficult and each must be considered as an individual case. A number of gullies exist on the watershed and, because they can deteriorate rapidly and soon remove good agricultural land from use, these should be taken out of use immediately and a program of control instituted. Primarily, this is a job for the individual farmers on whose lands they lie, but there is also a public interest involved and the Authority should take an active interest in their control.

(b) GRASSED WATERWAYS

There are many cultivated fields on the watershed where farmers find washouts occurring in drainage courses after heavy rain. These are possible gullies of the future and are logical places for the construction of grassed waterways. These waterways may require widening and grading, after which they should be fertilized and seeded down to a densely-growing, thickly-rooted grass mixture. The waterway should be liberally wide and can often provide good hay and pasture as well as perform its prime function of water control. If used for pasture the grazing should be controlled to prevent deterioration of the waterway.

Grassed waterways may, in most instances, be constructed using the farmer's own machinery. The main essential is that there be a desire on his part to do the job. The Authority may do much to foster this interest, perhaps by a partial subsidy or the provision of special machinery where it is needed.

(c) PRIVATE REFORESTATION

There is a considerable number of small parcels which could and should be reforested and maintained privately. Most of these parcels are situated on the steeply-sloping banks of the creeks where erosion has taken its toll. The Authority should assist owners in planting these areas and should strongly encourage such planting. Some of those areas mapped as classes VI and VII should be returned to forest.

(d) FARM DRAINAGE

A significant acreage of the watershed suffers from imperfect soil drainage and crop production is made more difficult because of it. Although the Authority does not have any direct responsibility for farm drainage, these responsibilities being met in the various Drainage Acts, it does have an interest in promoting the advantages of farm drainage and in seeing that certain aspects of it are properly done. This interest would not be defined in legal terms but in publicity and education.

Of the two types of drainage, ditch and tile, the latter is the most important although generally the more expensive to install. Under The Tile Drainage Act a farmer may obtain low cost loans from the Province through his township for 75 per cent of the cost of the work. These loans run for a period of 10 years but the farmer may pay them off at any time and experience has shown that adequate tile drainage frequently pays for itself in higher crop yields and lower operating costs in 2 or 3 years. The drains thus pay handsome dividends during the many years of their life.

Under its land use program the Authority may take an interest in promoting adequate farm drainage and satisfactory drain outlets. Many gullies in the Province have started because adequate precautions were not taken to ensure that the tile outlets were provided with headwalls and splash aprons.

(e) FARM PONDS

In recent years irrigation of crops has become an essential feature of portions of our farm economy. This is especially true in some areas of specialized production such as the Norfolk tobacco belt. Irrigation is not restricted to the high-value specialized crops, however, and some farmers in the Province are using it as a means of increasing the productivity and quality of general crops like pasture.

In the Upper Black Creek Watershed there is a combination of the intensive and more general farming. For satisfactory production both require good supplies

of water. In an area such as this valley where surface water supplies are not always satisfactory the need may often be met by farm ponds. Such ponds may supply water for irrigation, stock, fire protection, spraying and recreation. For satisfactory use and long life these ponds—of whatever type—should be properly built and maintained. Although the Authority provides a direct subsidy for only certain types of pond construction it does provide engineering assistance and can, consequently, through this means and through education and publicity, guide farm pond construction so that each pond will operate satisfactorily for the longest possible time.

(f) STREAM CHANNEL CONTROL

Stream bank erosion is not, generally, a great problem in the watershed, but there are sections of the stream which should be watched and, if necessary, remedial control measures taken. A major problem in this regard is allowing cattle to trespass on the stream and trample the banks and pollute the water. The Authority may, at times, find it desirable to assist in stream bank grading and planting and in channel straightening.

Although the Authority may do much to promote good land use in the valley by providing aid in worth-while individual projects and by demonstration, perhaps the greatest good will be accomplished in the long run through education and publicity. The Authority should, therefore, work as closely as possible with farmers' organizations and with the young folk in their schools. These young people are usually quite enthusiastic about things such as tree planting days, school conservation scrapbooks and so on. It should be remembered, too, that they are the farmers and citizens of tomorrow and will have a great deal to say about the manner in which our land is used.

A major endeavour of the Authority should be the promotion of land use planning on the individual farms in the valley. Much that the Authority will want to accomplish in the field of improved land use in the years ahead will come about through farm plans. Initial progress in this matter will, without doubt, be modest, but quiet persistence will bring results. Farm planning is worth while and does pay for itself if properly carried out. It is therefore urged that the Authority, with the assistance and advice of the Agricultural Representative, explore ways and means of encouraging farmers to have their farms under plan.

Tobacco fields can be protected from wind erosion by well placed windbreaks.

FOREST 3

CHAPTER 1

THE FOREST

1. AT THE TIME OF SETTLEMENT

Little remains of the original forest of Southern Ontario, particularly in such areas as the Big Creek Region where the land is mostly of high agricultural value; but the vestiges which have survived and the works of contemporary writers help in reconstructing the scene. From these it is possible to see the reasons for the animosity of the pioneers to this great, oppressive and fearsome thing which overlay the good earth and must be hacked, slashed, beaten down and burned if they themselves were to survive.

Anna Jameson, travelling by stage coach from Toronto to Detroit in 1837, gives the following picture of the forest between Brantford and Woodstock, just north of the Big Creek Region, as seen through the eyes of a visiting Englishwoman:

> "No one who has a single atom of imagination can travel through these forest roads of Canada without being strongly impressed and excited. The seemingly interminable line of trees before you; the boundless wilderness around; the mysterious depths amid the multitudinous foliage where foot of man hath never penetrated and which partial gleams of the noon-tide sun, now seen, now lost, lit up with a changeful, magical beauty . . . the solitude in which we proceed mile after mile, no human being no human dwelling within sight."

Later on she gives a vivid sketch of the typical clearing:

> "The aspect of these was almost uniform, presenting an opening of felled trees of about one acre or two . . . great heaps of timber trees and brushwood laid together and burning; a couple of oxen dragging along another enormous trunk to add to the pile. These were the general features of the picture framed, as it were, by the mysterious woods."

The Reverend J. Proudfoot has left the following account of his travels through the Big Creek Watershed in 1833:

> "Left Mr. Lalor's (on Otter Creek) this morning in a waggon which we engaged to take us 18 miles for $2. Upon leaving his house we entered upon the sandy ridges which extend over the remainder of Bayham. The part of Houghton through which the Talbot Street runs and the whole of Middleton, the Timber is all pine not very heavy but closely set; now and then we saw a little hard-wood. The soil is the worst I have seen. During the day saw about 20 deserted houses. The small clearings which we passed begun to be covered with pine and were fast relapsing to the domain of the forest.
>
> "While we were at Sovereign's tavern (Delhi) there was a man going to Vittoria with a waggon and two horses, and he took us for $1. The road here is all down hill. At first it was oak plains, where the soil is sandy but good for wheat, then pine flats, where we saw some of the handsomest pine trees I had ever seen. We saw some fine clearings, and a field of at least 50 acres of fine wheat."

These early descriptions indicate that the original forest was predominantly oak and pine while sugar maple and beech with associated southern hardwood species occupied the best soils. Soft maple and elm occupied similar but poorly

drained soils, particularly on the heights of land between watersheds. Oak, in open park-like groupings, held possession of the sand plain while scattered white pine trees towered above the hardwood forests and grew in stands on well drained soils. White cedar and mixed woods of white cedar, hemlock, white pine, soft maple and yellow birch grew on the muck areas.

The apparent suitability of the greater part of the soil of the Big Creek Region for cultivation and the inimical attitude of the settlers to the forest led to very rapid depletion of the woods, and the swing of the pendulum carried the clearing of them past the bounds of economic necessity and past the point which would have left the minimum area of woodland required to protect the natural water-storage areas of the watershed.

2. SINCE SETTLEMENT

When a new area was opened for settlement the light land was frequently taken first because it bore the more readily merchantable species of pine and oak, and the rough and swampy areas were avoided. Land was usually cleared first along the fronts of the farms and the woodland cut farther and farther back toward the end of the farm which lay farthest from the road. This was done in most cases without reference to the quality of the soil except where it was swampy, with the result that in some areas the majority of woodlots now lie at the back of the farms between the concessions.

The land bordering swamps was eventually taken up, the swamps were partially drained so that the edges became dry enough for partial cultivation, and the forest was pushed back so that today the centres of the swamps form the nuclei of all the larger patches of woodland in the Big Creek Watershed. These swamps also form the largest natural surface water-storage areas, and in many cases are the sources of headwater streams. Trees will grow here in most cases and are probably the most profitable crop which can be raised, especially since they perform the additional function of protecting the source areas from too rapid run-off.

Although settlement was barely started before the early part of the nineteenth century and the forest was almost unbroken along Governor's Road for miles west of Ingersoll as late as 1837, so rapid was the reduction in forest cover that by 1860 the forests of Norfolk, Oxford, and Brant Counties were depleted by more than 60 per cent, by 1910 by almost 90 per cent, and by 1940 the Census of Canada showed woodland figures for the counties embodying the Big Creek Region to be: Norfolk 14.4 per cent, Oxford 6.7 per cent, Brant 8.4 per cent.

Cultivation of the sandy soils soon exhausted their humus content and fertility, and run-down and even abandoned farms were a common feature of the countryside in the early 1900's when much of the land began to revert naturally to woodland. With the introduction of tobacco-growing in the early thirties it became profitable to clear these lands again and in recent years much of the remaining woodland has been cleared for this purpose.

CHAPTER 2

SURVEY OF PRESENT WOODLAND

An accurate inventory of the existing woodland in the watershed and an estimate of its present condition are basic necessities in establishing a woodland conservation program. A detailed study was made of all woodlands, scrubland,

plantations and land suitable for reforestation.

The Big Creek Region lies within the Deciduous Forest Region, the boundary of which passes close to its northern limits. The Deciduous Forest Region enjoys a very moderate climate modified by being bounded by the Great Lakes—Ontario, Erie and Huron. Though the forest in this region consists primarily of beech and sugar maple together with basswood, red maple, red, white and bur oak, a large number of other species, many of small size, find their northern limit here. Among these are chestnut, tulip tree, pignut hickory; black, pin, chinquapin and chestnut oaks; black gum, blue ash, magnolia, papaw, Kentucky Coffee tree, red bud, red mulberry and sassafras. In addition, within this region is the main distribution in Ontario of black walnut, sycamore, swamp white oak and shagbark hickory, together with the more widely distributed butternut, bitternut hickory, rock elm, silver maple and blue beech. In general coniferous species are poorly represented, but white pine is abundant locally on the lighter soils.

1. SURVEY METHODS

Aerial photographs, each covering about 1,000 acres, were provided to the forestry party, and mapping in the field was done directly on the photographs. Each area of woodland, scrubland, swamp and rough land was visited and described as to acreage, cover type, presence of grazing, reproduction and average diameter at breast height.

Each woodlot was classified as hardwood, coniferous or mixed. The term "hardwood" is used to denote all broad-leaved trees regardless of their physical hardness. A woodlot in which 80 per cent or more of the trees are hardwoods is called a hardwood stand, one in which 80 per cent or more of the trees are conifers is called a coniferous stand, and all other stands are classed as mixedwood.

Plantations were likewise examined and records made of method of planting, approximate age, care, damage and survival.

Land suitable for reforestation was mapped and descriptions prepared in some detail for the larger areas.

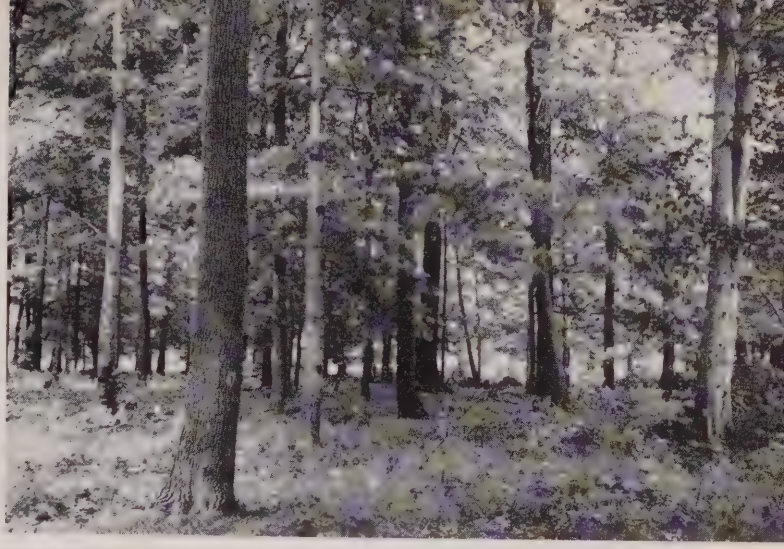
2. FOREST COVER TYPES

The term "forest cover type" refers to those combination of tree species now occupying the ground, with no implication as to whether these types are temporary or permanent. A slightly modified form of the system drawn up by the Society of American Foresters has been used on this survey so that the system will adequately describe the cover types common to the watershed.

The cover types encountered in the Big Creek Region are Aspen, Poplar—oak, Pin cherry, Paper birch, White pine—red oak—white ash, White pine, White pine—hemlock, Hemlock, Sugar maple—beech—yellow birch, Sugar maple—basswood, Sugar maple, Black cherry, Yellow birch, White cedar, Tamarack, Black ash—white elm—red maple, Bur oak, Black locust, White oak—black oak—red oak, White oak—black oak—hickory, White oak, Red oak—basswood—white ash, Red oak, Beech—sugar maple, Beech, Ash—hickory, Silver maple—white elm, White elm, Cottonwood, Willow.

The woodland is extremely varied. Due to clearing of the better drained soils, the various swamp hardwood types appear more prominent, comprising 27 per cent of the remaining woodland. The beech—sugar maple type makes up 18.3 per cent, the mixed oak type 16.9 per cent and the aspen and poplar—oak types 16.8 per cent.

Most of the sandy areas of the watershed were covered with oak and pine forests. So few of these remain that every effort should be made to retain those which are left.



Poplar is a versatile species which grows on both wet and dry soils. It frequently serves as a nurse crop for better trees.

White cedar grew in many of the stream valleys and still occupies some of the wet sites. This is a spring area in which many permanent - flowing springs come to the surface and the tree cover should be encouraged and maintained.

3. CONDITION OF WOODLAND

Woodland within the watersheds comprises 67,861 acres, which is 17.3 per cent of the total area of 393,026 acres. Of this woodland, 88.2 per cent is classed as hardwood stands, 9.6 per cent as mixedwood and only 2.2 per cent as coniferous. There is no doubt that conifers originally formed a larger part of the woodland than they do today, but their numbers were diminished because of the desirability of the lumber they furnished, and recurrent fires have destroyed them while more fire-resistant species such as oak have survived. In addition, much of the best pine land is also well suited to tobacco farming and is now used for that purpose.

Very little of the present woodland is mature and merchantable. Only 0.8 per cent, practically all hardwood, is classed as over 18 inches diameter breast height. Coniferous stands between 10 and 18 inches, a size suitable for poles, make up only 0.8 per cent. The 15.1 per cent of young stands, under 4 inches diameter breast height, and the 57.6 per cent of hardwoods and mixedwood between 4 and 10 inches will require some time to grow to merchantable size. This time may be shortened by thinning the stands where necessary. The remaining hardwoods and mixedwood between 10 and 18 inches diameter (24.7 per cent) and conifers 4 to 10 inches (1.0 per cent) will soon be large enough to provide some merchantable material and should pay for proper management in a relatively short time.

The survey indicates that 71.7 per cent of the woodland is uneven-aged and therefore might readily become a source of continuous revenue to the owner. However, this continuous production will not last for long unless there is an improvement in natural regeneration in the woodlots. Nearly one-quarter of the woodland area shows virtually no regeneration. Less than 13 per cent showed regeneration which could be classed as "good" to "excellent". Fires, considered as unimportant by many woodland owners, are one cause for this condition. The grazing of 22.9 per cent of the woodland is another serious factor. Very few woodlots are fenced against cattle, and only the lack of livestock in the tobacco areas prevents more widespread grazing damage.

Slightly over half the woodland has about the desired degree of stocking, and one-fifth is definitely overstocked and needs thinning for improved growth. The rest is understocked or sparse, requiring planting or at least protection to bring it back to a fully stocked condition.

4. SCRUBLANDS

Trees of species which never attain commercial size cover 4,535 acres. The most common species are scrub willow and dogwood on poorly drained sites and hawthorn and sumach on dry sites. In some cases this land can be improved for agriculture through drainage or through eradication of dry scrub. However, where such restoration does not seem economically feasible, the area should be returned to tree cover through systematic replacement of the scrub species with more valuable species.

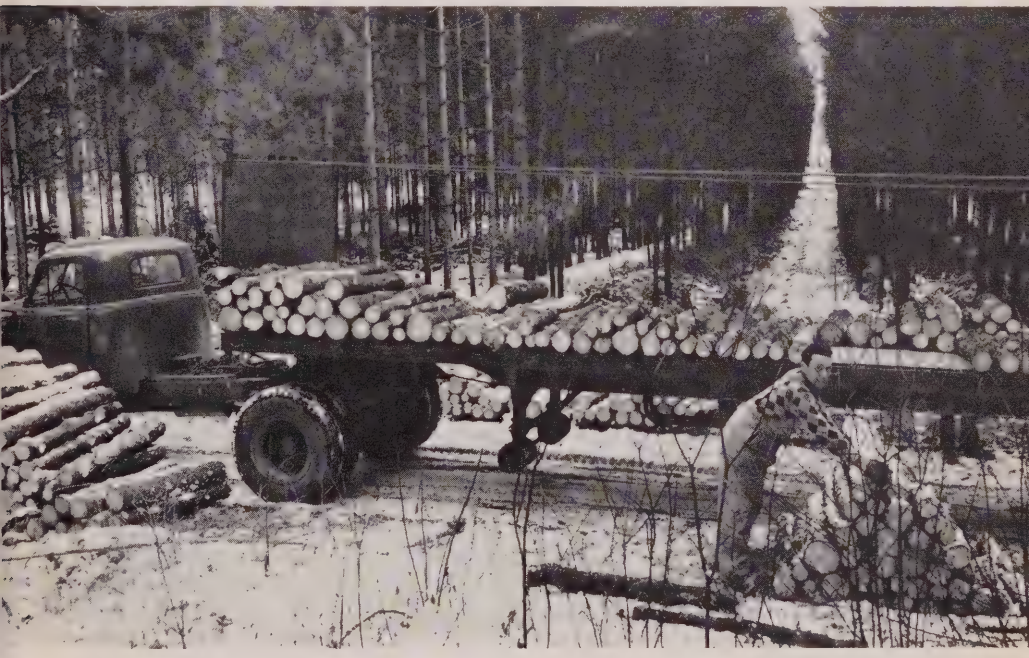
CHAPTER 3

MARKETS AND MARKETING

Considerable information about markets for local woodland products has been gathered by the Erie District office of the Department of Lands and Forests

Thinnings from this 25-year-old red pine plantation have yielded a return of $100 per acre.

Jack pine 30 years of age on Norfolk County's Plot No. 12 is being thinned for pulpwood.



Pulpwood being loaded for shipment to a mill at Thorold. Wide spacing in the original plantation, not less than 6 feet by 8 feet for red pine, means larger diameter trees and better pulpwood. Plantations with closer spacing cannot be profitably thinned at 25 to 30 years of age.

at Aylmer. This information, together with observations made during the woodland survey, supplies a general picture of marketing conditions in the Big Creek Watersheds.

For quality products, such as veneer logs, buyers will come one hundred miles or more. For low-grade material ten miles may be the limit, and often it is difficult to find a buyer at all. On the other hand, some woods are brought into the area which might be purchased locally if they were grown there in the quantity and quality required.

In many parts of Ontario the truly portable mill, moving to the woodlots it cuts, has disappeared before the impact of better roads and improved truck-hauling to stationary mills. In the Big Creek area portable mills have persisted. Frequently such mills depend on custom sawing for woodlot owners, the quality of lumber sawed is low and the mills operate only a few days to a few months each year.

As elsewhere, one of the most serious problems is the lack of an adequate market for small or low-grade material, which should be removed to improve the growth of quality material in the woodlot. The market for fuelwood for domestic use or tobacco kilns has declined sharply in the face of competition from other fuels, but this use still remains of some importance. A pulpwood market for thinnings from pine plantations is already well established. No such market for hardwood thinnings exists as yet, but recent advances in the pulp and paper industry make it reasonable to expect such a development within the next few years. This type of market does not promise large returns to woodlot owners, but it does promise to defray the cost of woodlot improvements which will allow the progressive owner to produce the quality products from which his real profits are derived.

1. THE TIMBER HARVEST

Harvesting of timber involves four operations: estimation of volume, cutting, skidding and hauling. The owner may perform all operations, selling his logs at the mill; he may cut and skid the logs, selling them at the roadside; or he may sell his timber on the stump.

(a) *Estimating*

Estimation of timber may be done either in the tree (cruising) or in the log after cutting (scaling).

Some operators cruise timber by rough ocular estimate; that is, by walking through the bush and estimating, on the basis of past experience, the number of board feet in the stand. The most accurate method would be to measure each tree, consider taper and defect, estimate and tally its volume. In large wooded tracts only a representative sample, say 10 per cent or 20 per cent, may be measured and the total estimated from this sample.

One example may illustrate the value of a tallied cruise. Some years ago, in competitive bidding for 87 acres of woodland, one operator estimated a stand, by tallying every merchantable tree, to be 700,000 board feet; the chief log buyer for a large furniture manufacturer estimated 350,000 board feet; another operator estimated 100,000 board feet. The actual cut from the stand was 746,000 board feet. Obviously such discrepancies are of concern to the seller as well as to the bidder who tries to maintain his place in competitive buying. Before selling standing timber, it would pay the owner to make a tallied cruise or, if necessary, to hire professional assistance for this purpose.

Similarly, when selling logs, the owner or his agent should assist in their measurement, try to understand the allowance which must be made for defects and assure himself that he is being fairly treated.

(b) *Cutting and Skidding*

In a typical hardwood operation, the value of logs at the roadside may be half as much again as that of logs in the standing tree. The difference is mainly labour cost.

By performing the operations of cutting and skidding, the farmer increases his return by selling his labour and use of his equipment instead of just his stumpage. The flexibility of woods work in fitting into otherwise slack seasons on the farm should make this increased return particularly attractive. In addition, the farmer doing his own cutting is best able to determine that the right trees are removed and damage to the remaining stand kept as low as possible.

(c) *Hauling*

Truck-hauling has increased the distance from which mills can secure their logs. Cost per thousand board feet hauled depends largely on distance. Thus, while grade 1 logs might be hauled up to 50 miles, the lower value of other logs might limit practical hauling distance to 15 or 20 miles.

While actual figures will vary greatly, the example below will suggest the change in log value at various stages.

Value of logs in the tree (stumpage)	$28 per M board feet
Making logs from tree	8 " " " "
Skidding logs to road	8 " " " "
Hauling logs to mill	6 " " " "
Value of logs in mill yard	$50 " " " "

2. TIMBER SALES

(a) *Outright Sale of Woodlot*

Frequently a sawmiller finds the simplest procedure is to buy the woodlot or farm outright. In this case, the former owner has no further interest in the land. The practice of slashing such woodlots and leaving them to become tax-delinquent was legitimate cause for community concern. Where tree cutting by-laws are rigidly enforced, this abuse should be kept under control.

(b) *Sale of Cutting Rights*

Under this method the owner sells the right to cut all timber of certain species down to a certain diameter; or the trees to be cut may be marked in advance and the sale made on this basis. Often only a very vague word-of-mouth agreement is made and misunderstandings are common. A simple written agreement would avoid this confusion.

A lump-sum method of payment is often used on such sales, based upon a volume estimate by the buyer. As mentioned in the section on cruising, the volume estimates of different bidders may vary considerably. The seller is therefore advised to consult the list of buyers of woodland products in the hands of the Zone Foresters and to obtain competitive bids from as many buyers as possible. On lump-sum purchases the buyer takes all the risk as to accuracy of estimate and quality of timber.

Selling the standing timber at a rate per thousand feet removes the uncertainty of volume estimates and requires measurement of the logs after cutting. Two uncertainties remain—the log rule to be used in measurement and the assignment of logs to different grades which differ in prices per thousand board feet. For Provincial Government transactions the new Ontario Log Rule is now required, but for private sales there is no set standard, the Doyle Rule being most commonly used. The woodlot owner seldom knows the problems of processing logs into lumber sufficiently well to understand fully why the buyer assigns some logs to lower grades. Publication of price lists and grade specifications by log buyers would promote better relations with woodlot owners. Possible arguments and ill feeling over these matters are factors in making some buyers prefer lump-sum purchase. The woodlot owner must decide whether to accept volume and grade risks in the hope of getting a better price by selling on a log measurement basis.

In the event that he chooses to be paid on a volume-removed basis, just what the buyer intends to cut and pay for should be absolutely clear. Only the best trees might be removed, and it is possible that only the best logs from these trees might be taken. This leaves the owner with many poor quality logs which he cannot readily sell and with some poor trees standing which he wanted cut. The volume actually paid for might be small, and the woodlot owner's total realization on the transaction might be less than he would have received had he accepted payment in a lump sum.

No matter which of these two methods is chosen, a written Timber Sale Contract should cover the transaction. It should set forth all the details necessary as to prices, species, sizes, rights granted to the buyers, limiting dates, times of payment and so on.

(c) *Owner-Made Logs*

The woodlot owner who has decided to realize not only the value of his woodland product but also the additional labour income derived from its harvest prefers to take payment at a price per thousand board feet for logs placed on skids at the roadway or logs delivered to the mill. Here again the securing of competitive bids and a clear understanding with the buyer regarding log grade will avoid any feeling of unfairness in the deal. An owner who simply arrives at the mill with a load of logs may feel that he has to accept the offered price even though he is dissatisfied.

CHAPTER 4

FOREST CONSERVATION MEASURES IN PROGRESS

1. PRIVATE PLANTING

The soil of a considerable portion of the Big Creek Region is of a light, sandy nature, ideally suited to reforestation purposes. These conditions led to the establishment of the Provincial Forest Station at St. Williams in 1908. As a result the value of windbreaks and forest plantations was gradually realized. With the development of tobacco growing, much of the light soil was no longer available for trees and in some cases former plantations have been cleared. However, private tree planting has continued on lands unsuited to tobacco and a total of 5,630 acres is now established on these watersheds. The portion of this area established by various dates is:—

When the tree cover is removed and the area is pastured or burned or both, useless shrubs such as willow and dogwood occupy the land and prevent trees from establishing a foothold. Such areas are not only non-productive but snow melts earlier here and water runs away faster than in the wooded swamps.

Present Plantations Established by	Area (Acres)
1925	200
1935	2,518
1945	4,327
1955	5,630

Private individuals and municipalities may obtain advice and assistance in reforestation and woodlot management through the Department of Lands and Forests' Zone Foresters at Aylmer for Norfolk County, at Stratford for Oxford County and at Hespeler for Brant County. The Zone Forester also assists in the establishment of Authority forests, county forests, demonstration and school plots.

The interest shown in private reforestation in the Big Creek Region is encouraging, but it should be noted that the 609 acres planted in the whole Authority area in the past five years is less than the 793 acres of woodland and plantation cleared on the Big Creek Watershed alone in that same period.

Survival and growth of seedlings have been good, but recent insect damage has caused some concern. Nearly half the older plantations have been thinned and a similar area pruned. The remainder would benefit from similar treatment. In a few cases cattle have been allowed to damage the plantation, and in several others fire has caused some damage.

Nearly half of the recent plantings are devoted entirely to Christmas trees. Only a small minority of these growers are pruning or otherwise caring for their plantations to produce top quality trees.

2. AUTHORITY FORESTS

Twenty-one Conservation Authorities have now entered into agreements with the Ontario Government for the establishment and management of Authority forests. The Province advances half the cost of the land and, in some cases, where it is necessary or desirable to include merchantable timber as in the Backus purchase on Big Creek, the Province also assumes the cost of the merchantable timber. These agreements run for periods up to 50 years, during which time the Ontario Government agrees to establish the forest and pay the cost of such items as fencing, buildings, equipment, labour, maintenance, trees, etc.—in short, everything connected with the management of the forest.

At the end of the period the Authority may exercise any one of three options: *First,* to take the forest over from the Government and pay back the cost of establishment and maintenance without interest; *second,* to relinquish all claim to the forest, whereupon the Government will pay to the Authority the balance of the land cost without interest; *third,* the forest may be carried on as a joint undertaking by the Province and the Authority, each sharing half of the cost and half of the profits. Authority lands are subject to municipal taxes.

A primary consideration in choosing areas for Authority forests is the protection of the headwaters of streams. The Big Creek Conservation Authority, in implementing the Big Creek Conservation Report, 1953, had purchased 400 acres, and during the 1955 survey took options on another 1,041 acres of land which were subsequently purchased. This area included the 651 acres of the Backus Woods, one of the finest tracts of southern hardwood forest remaining in Ontario.

The streams furnishing water to Big Creek nearly all rise in hardwood swamps similar to this. Such swamps produce silver maple, white elm, swamp white oak and black gum. These swamps are the natural water-storage areas of the watershed and should be preserved as such. The trees furnish the only crop which can be raised here and help to conserve moisture for summer flow.

The present Big Creek Region Authority Forest is distributed by townships as follows: Burford 330 acres, Charlotteville 189 acres, Houghton 155 acres, Middleton 200 acres, Walsingham North 200 acres, Walsingham South 1,035 acres, Windham 198 acres, Woodhouse 45 acres. Total 2,352 acres.

3. COUNTY FORESTS

Many counties have established forests under agreements which differ only slightly from those described for the Conservation Authorities. A few counties, including Norfolk County, have preferred to manage their own forests rather than place them under agreement with the Department of Lands and Forests. Norfolk County now has a forest of 1,769 acres in a number of separate tracts scattered through the Big Creek Region.

4. PROVINCIAL FOREST STATION

The Provincial Forest Station established in 1908 has expanded until Station No. 1 at St. Williams has about 2,000 acres and Station No. 2 at Turkey Point is now nearly as large. Parts of the area are used for nursery beds to raise seedlings for distribution and the remainder of the tract for experiment and demonstrations of the management of plantations.

5. MUNICIPAL FORESTS

Municipal forests are areas owned and managed by municipalities other than counties. Windham Township has an excellent plantation of 55 acres on Highway No. 3 east of Delhi which was established in 1923. The trees are 30 feet in height and are now yielding returns from thinnings.

Townsend Township has two plantations, 50 acres just south of the Waterford ponds established about 1940 and a much smaller area at the head of Nanticoke Creek established ten years later.

The Town of Simcoe owns 162 acres in the ninth concession of Charlotteville which were acquired to protect the stream feeding Crystal Lake. Most of the area is scrub oak and poplar which has been underplanted with pine to improve the forest cover. An additional 50 acres on the west edge of Simcoe have been planted recently to protect the town wells.

6. DEMONSTRATION WOODLOTS

The most important measure which could be taken for forest conservation would be the improved management of present woodlots. An early effort in this direction was the establishment by the Department of Lands and Forests of demonstration woodlots. These are areas of private woodland on which the owners have agreed to follow prescribed methods of woodlot management and to permit access to the area by interested persons.

Thirteen demonstration woodlots were established in the Big Creek Region. Most of these woodlots are still in good condition, and no doubt they exert an influence for proper management in the surrounding area. In a few cases the woodlots have been cut over when the property changed hands or have been neglected so that they no longer serve their original purpose.

7. TREE FARMS

In the past few years a movement has been under way to recognize well-managed forest properties as Certified Tree Farms. With the sponsorship of several organizations interested in better forestry, the Canadian Forestry Association in 1953 formed a National Tree Farm Committee to recognize with a suitable sign and

certificate those owners who agree to maintain their land for growing forest crops, protect the land adequately, agree that cutting practices will be satisfactory to ensure future forest crops, and permit inspection by Committee foresters. Plans for certification of Tree Farms in the Big Creek Region had not yet been completed at the time of the survey.

Several Conservation Authorities have become co-sponsors of the Tree Farm movement in their areas, and it is recommended that the Big Creek Region Conservation Authority give its support to this movement.

8. TREE-CUTTING BY-LAWS

Under The Trees Conservation Act of 1946 and its successor The Trees Act (R.S.O. 1950, c. 399), twenty-one counties have passed by-laws to restrict and regulate the cutting of trees. These by-laws do not interfere with the right of the owner to cut material for his own domestic use, but specify certain diameters below which trees may not be cut for sale.

The limits provided by the counties covering the Big Creek Region range from 12 to 14 inches for major species and from 5 to 10 inches for minor species such as cedar and poplar.

Better than a rigid diameter limit is the marking of trees for cutting according to their condition. Professional advice on such marking is available through the Zone Forester. Many tree-cutting by-laws provide for the necessary variations from a strict diameter limit where the cutting is done under such supervision and in accordance with good forestry practice.

9. 4-H CLUBS

These clubs are organized by the Ontario Department of Agriculture assisted by the Department of Lands and Forests and must be sponsored by an organization interested in the improvement of woodland and reforestation.

At present none of these clubs is operating in the Big Creek Region. Sponsorship of such clubs would be a worthwhile project for the Authority.

CHAPTER 5

SOME FOREST CONSERVATION MEASURES REQUIRED

The activities through which the Authority may further forest conservation fall into three broad categories. In woodlot improvement demonstrations or private planting the Authority may co-operate with private landowners. In larger areas needing reforestation or management the Authority may acquire land and manage it directly. Through public meetings, field days and publications the Authority may educate and encourage residents of the Big Creek Region to practise conservation on their own lands.

1. BIG CREEK AUTHORITY FOREST

One of the most important conservation measures required in the Big Creek Region is the establishment of forest areas under the Conservation Authority, which will serve to protect the natural water-storage areas of the valley and will revive or maintain the productivity of areas which would otherwise be neglected. A number of such areas have been defined, mainly at the headwaters of the streams within the Authority area.

In all, 12,741 acres are recommended for acquisition by the Big Creek Region Conservation Authority. Of this total 3,180 acres are open lands, 8,925 acres have some form of tree cover and 636 acres are covered with scrub growth. A minimum of land in the better classes has been recommended for reforestation. However, it was impossible to omit such land entirely when it formed a small part of a lot which was composed mainly of a poorer type of soil. In the few cases where these lands are already being well managed by private owners, there is no urgency for public acquisition. Even here, however, the Authority must be alert to see that a change in circumstances does not allow these lands to fall into other hands in which their usefulness for conservation purposes might be destroyed. It is for this reason that these few properties are included in the recommended areas.

The problem of land acquisition should be approached carefully. In most cases purchase will be arranged by direct negotiation. The Authority should also be alert to acquire tax-delinquent lands. The Authority has the power to expropriate land and is justified in doing so when an unreasonable attitude on the part of the owner stands in the way of works urgently required for the general good. However, a favourable public attitude is essential to the furtherance of conservation, and such powers must be used with discretion. Very few of the recommended properties are occupied. In an exceptional case, if a hardship would be entailed by asking an old resident to move, some special provision such as a life tenancy of the house might be arranged.

The Authority has already made a good start by the acquisition of 2,352 acres of the recommended area.

2. PRIVATE REFORESTATION

On many farms, even in good farming areas, there are small tracts which, because of steep slopes, poor drainage or severe erosion danger, would be better in tree cover. These tracts are not suitable for public acquisition and management, but the effect of reforestation on control of run-off, improved summer stream flow and stabilization of wood-using industry justifies public assistance in such work. These areas have not been privately reforested heretofore because the owner has some other minor use for the area, because he is discouraged by the long period between planting and harvest of a forest crop or more commonly simply because of inertia on his part. The interest of private owners in reforestation may be fostered in several ways. Public education, such as that now carried out by the Zone Forester in the district, can be furthered by the Authority. In addition, direct assistance to private planting can be given. Several other Conservation Authorities have purchased tree-planters which supply a planting service to private owners at a nominal cost. Where rough ground makes hand planting necessary, some Authorities pay a direct cash subsidy if inspection shows that planting has been done carefully and the plantation is adequately protected from livestock.

It is the policy of the Department of Lands and Forests to charge $14 per thousand for Scotch pine and $10 per thousand for other planting stock. For some years trees were distributed free. Following the end of the war in 1945, the nurseries were unable to meet the greatly increased demand, and it was felt that a charge for trees would ensure more care in ordering the required amount and in planting the trees received. The assistance schemes carried out by other Authorities have stimulated interest in private reforestation while still ensuring the good use of the planting stock. It is recommended that the Big Creek Region Conservation Authority adopt some similar policy of assistance to private reforestation.

The diameter limit by-law does not prevent the owner from cutting trees under the limit for his own use and many woodlots are clear-cut to provide fuel for kilns.

In this case oak logs up to 15 inches in diameter were cut for fuelwood and burned.

3. WOODLOT IMPROVEMENT PROJECTS

For most persons the best lesson in conservation is field observation of specific examples of the present abuses and efforts to remedy them. Woodlots chosen as illustrations must be near good roads and should be marked with large signs giving considerable detail of conditions and improvement measures in progress. Roadside or other parking facilities would have to be provided so that visitors could take the full time necessary for inspection without interfering with other traffic.

Some of the proposed improvements are experimental in nature. From the owner's point of view the whole program may seem to be of unproved value. On these sample areas the Conservation Authority is therefore fully justified in assuming part of the actual woodlot improvement cost as well as the cost of signs and parking facilities.

To use a private woodlot in this way for educational purposes would require a definite agreement with the owner to ensure that the proposed improvements were carried out, and that the benefits of this work would not be lost by a change of ownership or of attitude on the owner's part. In addition a detailed record of costs and returns would be necessary to show other owners that it would pay for them to adopt similar practices in their own woodlots.

Some owners may be willing to see their woodlots used for such demonstrations, but wish to be relieved of any personal participation in the project. In such cases the Authority might lease the woodlot or purchase it outright.

The report lists seven examples of well-located woodlots suitable for Authority woodlot improvement projects. The Conservation Authority should decide on suitable forms of agreements, leases, etc., explain the purpose of these projects to the owners and try to enlist them as co-operators. This list is by no means exhaustive, but serves to illustrate the type of woodlot suitable for such projects.

4. FOREST RESEARCH

Detailed scientific research is the task of universities or government departments with greater research facilities than are available to a Conservation Authority. Large-scale application of proven methods is the task of private owners or of the Department of Lands and Forests in managing Authority Forests. Between these two extremes, however, there are many possibilities for small-scale investigations which are urgently needed and which the Authority might encourage on its own land or on private land under agreement.

5. THE AUTHORITY AND CONSERVATION EDUCATION

Many agencies at present do, or can, engage in conservation education. The Authority can supply opportunities and materials to encourage and enlarge these activities. Wall maps, literature, conservation pictures and conservation lectures supplied to the schools will help to give geography, history and conservation practices a local significance. Building up a library of slides on local conservation problems and accomplishments would be of great assistance to speakers.

The most effective educational activity is actual participation in or field observation of conservation projects. Tree planting days, group visits to woodlot improvement projects and conducted tours over a well organized conservation trail could all be sponsored by the Conservation Authority. These activities would all stimulate individual action on forest conservation measures, such as those described in the following chapter, which cannot be carried out directly by the Authority.

CHAPTER 6

FURTHER CONSERVATION MEASURES REQUIRED

1. WOODLOT MANAGEMENT

The woodlot inventory shows that there are 67,861 acres of woodland in the Big Creek Region. Practically all of this area requires better management. While experimentation is desirable to determine the best method of handling certain problems, the general principles of woodlot management have been known for years but have not been applied. A free advisory service is available from the Zone Foresters, but is not sufficiently used, and a readily understood pamphlet on "The Farm Woodlot" can be obtained from the Department of Lands and Forests.

One of the most difficult problems confronting the private owner in the management of his woodland is the utilization of the small woodland products which can be readily made and handled by the owner. These products such as fuelwood, pulpwood, bolts, posts and poles, if properly harvested, increase the productivity of the woodlot and the gross returns per acre. The volume of these small products has been reduced by diameter limit regulations which have restricted the wholesale commercial slashing of woodlots. Nevertheless, much material of this type could still be produced from thinnings and improvement cuttings and from limbs and tops of trees. The difficulty of marketing such low-grade material has seriously hampered owners in carrying out the needed improvement work in their woodlots. Any means which can be discovered for using small and poor-grade wood should be developed to the fullest extent. At the present time interest is increasing in the possibility of manufacturing wood chips in the woodlot by means of a portable chipper. Such chips can be used for the manufacture of pulp for paper, and as cattle bedding and chicken litter, which can subsequently be spread on fields to increase the humus content of the soil. They can be made from any species of wood, and tops and branches can be utilized. The number of pulp companies which can use hardwoods is limited at the present time and only those making kraft paper can use chips containing bark, but the demand for hardwood chips will increase and portable barkers are being developed. Every woodlot owner should consider the possibility of improving the quality of his woodlot by utilizing the low-grade material as chips or otherwise.

Owners of large woodlots might be encouraged to undertake thinnings and improvement cuttings if equipment or trained crews were available at reasonable cost. The Authority should consider offering such a service. As an alternative, the Authority might offer a subsidy for each acre improved to its specifications and found satisfactory on inspection by the Authority's officers.

2. ELIMINATION OF WOODLAND GRAZING

This abuse is less widespread in the Big Creek area than in some sections of Ontario simply because many farms devoted to tobacco growing do not carry any livestock. Where cattle are kept, grazing of woodlots is common. There are a number of reasons for the widespread practice of allowing woodland grazing. The woodlot has always been considered a pasture field even though the value of woodland pasture is low compared to cleared land. The reason for its low carrying capacity is partly because grass grown in the shade is not nearly as high in food value as that grown in full sunlight. The following statement in respect to woodland pasture has been made by leaders in agriculture: "On the whole, the opinion

of the Agronomists is that, on the average, woodland pasture will produce about one-sixth the quantity of pasturage, and the quality will be about one-half as good as that of the improved pasture". Weeds are usually prolific in wooded pastures, often smothering most of the grass.

If shade is required for stock, it may be desirable to leave a portion of the woodlot in the pasture when fencing the woodlot. Another solution is to establish small groves of fast-growing hardwoods which can be fenced temporarily until the trees are sufficiently tall that browsing will not damage crown growth. Where springs or streams that supply water for the stock are situated in the woodlot access may be made to a trough near the spring and the area should be fenced to prevent trampling.

A fully timbered maple stand, 60 years old, may yield about 4,000 board feet of saw timber per acre. Such a woodlot is virtually ruined by 20 years of heavy grazing, whereas 20 years of protection and no logging may increase the net volume to approximately 8,500 board feet per acre. The gain of 4,500 board feet is equivalent to an annual increase of 225 board feet per acre. At $28 per thousand on the stump this amounts to a mean annual gross income of $6.30 per acre over the period of utilizing only the increase in volume.

Livestock admitted to woodland browse on the leaves and shoots of small trees and ride them down, and by scuffing the surface roots of larger trees injure them and permit entry of fungus diseases.

Field observations indicate that cattle have preference habits in grazing woodlands. Unfortunately this preference is for the more economically desirable species such as maple, basswood, elm and beech, whereas undesirable species such as hornbeam, blue beech, dogwood and hawthorn are grazed only when cattle are seriously underfed. This combination of factors, under continued grazing, changes not only the quantity but the quality of the reproduction and so the succeeding stand. The poorer hardwood species, and conifers where these occur, are favoured. The invasion of pastures by cedar and hawthorn is an illustration of this grazing preference.

Livestock grazing affects more than the growth of trees on the owner's land. Soil erosion in the woodland increases as the absorptive capacity and mechanical protection afforded the soil by the litter are reduced. The open canopy exposes the soil to the erosive force of rain impact and a compacted soil forces overland movement of water. Livestock tend to follow trails in the woodland and these often become centres of serious erosion. Thus continued grazing increases surface runoff and soil erosion.

3. FOREST FIRE PROTECTION

Although much publicity has been given to the damage caused by fire, the average person does not realize how serious this damage is. He may know that young growth and small trees are burned by surface fires but he does not realize the extent of the less obvious damage such as the destruction of humus which itself preserves the condition and water-retaining capacity of the soil. When the humus and ground cover are destroyed the sun and dry winds remove the moisture required for tree growth and plant nutrients are destroyed. The heat of the fire also injures the growing tissue inside the bark of older trees which are not actually burned, exposing the wood to attack by insects and fungi. Even though through time the wounds may be completely healed, the damage shows up as defects when the tree is cut for lumber.

Fire is a serious menace on the Big Creek Watershed and a plan for combating it should be worked out immediately.

This was a plantation 23 years old destroyed by fire in 1949. The area has since been cleared. Every year plantations become more valuable and warrant adequate protection.

This field grew a crop of Christmas trees but was never replanted and now produces only weeds.

It is therefore recommended that the Authority set up a committee to determine the best method of providing fire protection for public and private lands, through the co-operation of the Department of Lands and Forests, for the protection of woodlands in the Big Creek Region.

4. PROTECTION FROM INSECTS AND DISEASES

In projects such as the public and private reforestation recommended for the Big Creek Region, careful consideration should be given to the prevention of outbreaks of insects or tree diseases and adequate arrangements made for the immediate application of control measures when these become necessary. It is essential that an inspection be made each year so that any abnormal increase in insects or disease may be noted and control measures initiated before the outbreak becomes serious. Prompt action may reduce control measures to a comparatively easy task and confine damage to a small area.

5. WINDBREAKS AND SHELTERBELTS

In the process of clearing land for agriculture, woodlots and belts of trees along fence lines have been removed which had served as natural shelterbelts. The restoration of these in the form of windbreaks is essential to a complete conservation program in many parts of Southern Ontario.

Experience has shown that windbreaks are an asset to any farm, that their adverse effects, if any, are local and easily remedied, and that in many areas they are essential to the control of soil erosion by wind. It is therefore recommended that the Authority encourage the establishment of windbreaks by private owners.

The preservation and proper management of the present woodlands is a primary concern of conservation. The Backus Woods are one of the finest examples of the southern hardwood forest remaining in Ontario.

WATER 4

CHAPTER 1

GENERAL DESCRIPTION OF THE WATERSHED

1. TERRAIN

The topography of the Big Creek Region varies, generally, from fairly flat with good drainage to undulating. Geologically, the area is fairly young, with the valleys on all streams being either V-shaped or U-shaped with little or no flood plains.

There are, however, a few exceptions to this generalization which should be mentioned. The topography of the Lynn River area is comparatively rugged with lateral slopes of both the river and its tributaries ranging from 50 to 150 feet to the mile. Another rugged area is found in the vicinity of Waterford, located on the Nanticoke Creek.

There are no natural lakes in the area and only two small marshy areas located at the headwaters of the Nanticoke Creek. The Waterford lakes, consisting of a mill-pond and several flooded gravel pits, are the largest bodies of water within the area and are a valuable asset to the region for recreation and summer flow. These lakes have a water surface area of about 350 acres.

The river valleys themselves break the general scene, with those on Big Creek below Delhi reaching 100 feet or more in depth and from a quarter to half a mile in width. These deep, narrow valleys offer many suitable damsites but, due to their low reservoir capacity, do not provide low-cost storage.

2. RIVERS AND MAIN TRIBUTARIES

(a) *Big Creek*

Big Creek is the largest stream in the region, draining a total of 281.0 square miles, and having a main channel 55.6 miles in length. The total fall is 428 feet, an average of 7.7 feet per mile. The creek rises at a point almost nine miles directly west of the hamlet of Harley, then flows eastward to a point two miles south-east of Harley from which point it flows southwards to Lake Erie, passing through Teeterville, Delhi, Walsingham and Port Royal. Its mouth is located in the Inner Bay at a point 1¼ miles south of Port Rowan.

(b) *Lynn River*

Lynn River and its numerous tributaries drain 108.8 square miles of the Big Creek Region.

Black Creek is an important tributary of the Lynn River system, draining the whole easterly part of the watershed. It has a total length of 13.2 miles with a fall of 200 feet giving an average gradient of 15.2 feet to the mile.

(c) *Dedrich Creek*

Dedrich Creek rises about 2 miles east of Silver Hill and flows south to empty into the Inner Bay of Lake Erie a mile south of Port Rowan. It drains the area east of the Big Creek for a distance of 13.7 miles with a fall of 203 feet, averaging 14.8 feet to the mile.

(d) *Young Creek*

Young Creek rises 2½ miles north-west of the hamlet of Walsh and flows 10.8 miles to its mouth at a point on Lake Erie about three miles south-west of Port Dover. It has a total fall of 203 feet and an average gradient of 18.8 feet to the mile.

(e) *Nanticoke Creek*

The Nanticoke Creek is the most easterly in the region. It is a long river, being 26.8 miles in length and with a total fall of 203 feet for an average gradient of 7.6 feet per mile.

CHAPTER 2

FORMER FLOODS

The earliest known references to floods on the Big Creek are to be found in the diaries kept by the surveyors who laid out the adjacent townships of Walsingham and Windham.

On March 10, 1796, the surveyor William Hambly, running westward on the line of the front of the second concession of Walsingham, came to the Big Creek, "which was broken up and very high, went up Stream and crossed and continued Line".

According to William Hambly's diary of his survey of Windham Township, there was a flood in November, 1797, on the Big Creek, while he was travelling eastward on the 8th Concession line of that township.

These records give the impression that flooding on Big Creek was an annual event (with a November flood thrown in for good measure); but the diaries cease with the completion of the surveys and with their discontinuance, so far as the Big Creek watershed is concerned, the record comes to an end. Not until 1809 is there any further mention of Big Creek floods; in May of that year the Deputy-Surveyor Mahlon Burwell, travelling from Fort Erie to perform a survey in the Township of Southwold, found Big Creek "very high."

Following Burwell's laconic reference there is an interval of twenty-seven years before the next known mention of floods in this watershed, by the Rev. Thomas Green, a travelling missionary. In a report to the District Council dated May 11, 1843, Mr. Allchin, the district surveyor, stated that the bridge over Big Creek on Talbot Street (at the present village of Delhi) was "intirely washed away by the late freshets at the breaking up of the Winter." No further particulars are known.

Whatever floods, or even flood damage, there may have been in the course of the ensuing thirty-five years is not known; not even passing mention of it has been found.

One of the severest storms ever to visit this Province struck on September 13, 1878, and caused immense damage over a wide area. The damage done on Big Creek must have been very great, but the account that the Toronto *Globe* published reported only the damage at Teeterville and at McKnight's mill, a mile or so below that village. It is probable that reports of damage elsewhere on Big Creek were crowded out of the news columns by the weight of more spectacular news from other parts of the Province.

The next flood on Big Creek of which any account has been preserved took place fourteen years later, June 3, 1892. The Toronto *Globe* of June 6 carried a brief report which, nevertheless, sufficiently indicated the severity of the flood.

In the ensuing sixty-five years from 1892 to 1957 there is evidence that floods have occurred on the Big Creek, and that they have done damage. The remains of a mill at Teeterville, and of more than one between Teeterville and Lynedoch, indicate some of the damage done. Considerable investigation and persistent inquiry have failed to attach a reliable date to any of these ruins, and the

Swollen Lynn River overflowing Sutton's Dam at Simcoe—February, 1954.

The Lynn River flooding Pond Street in Simcoe — February, 1956.

files of the Delhi *News-Record,* said to have been taken from the place of publication at the time of a change of ownership, have not been found. This state of affairs, unfortunately, cannot be taken to indicate that there have been no floods, but only that the records have, if made, remained undiscovered.

As a result of the haphazard methods by which the incidence of flooding has been recorded it happens that, of 11 occasions when flooding was noted on the Lynn River, not one falls on the same date as that of a known flood on the Big Creek.

Thomas Welch, the Deputy-Surveyor, on the Lynn River on January 16, 1798, noted "the Creeks, beaches, low ground & swamps so verry full of Water, Ice &c., that it was impossible to do business."

The next known observation of high water on the Lynn is recorded in the journal of the Rev. Thomas Green. He records floods in March, April, May and October of 1836.

After the lapse of thirty-seven years, the next known flood on the Lynn River was recorded by the Toronto *Globe,* April 10, 1873, and the next after that on February 9, 1900.

An unusually heavy rain fell at Simcoe, January 18, 1929, and flooded the entire north-western portion of the town.

Widespread flooding occurred throughout south-western Ontario in April, 1937, and there is no doubt that serious flooding also occurred in the streams of the Big Creek Region.

Throughout Western Ontario, severe flooding occured on many streams in April, 1947. On April 5, 1947, the Lynn River at Sutton's Pond dam, in the town of Simcoe, was ten feet above normal. On that date, an employee of the Riddell & McIntosh mill, in attempting to raise the waste-gate at the dam, fell into the water, and he and a would-be rescuer narrowly escaped drowning; but both men were brought safely ashore.

On February 17, 1954, the Simoe *Reformer* reported that the Lynn River had been in a state of flood.

Two reports of flooding have been definitely identified as having occurred on the Nanticoke Creek, one in March, 1852, the other in April, 1947.

CHAPTER 3

HYDROLOGY

Hydrology encompasses the behaviour of water as it occurs in the atmosphere, on the surface of the ground, and underground. The movement of water from the atmosphere to the ground and back again to the atmosphere is called the "hydrologic cycle". There are many factors which influence the water movement, and particularly that portion between the incidence of precipitation over land areas and the subsequent discharge through stream channels or direct return to the atmosphere by evaporation and transpiration.

1. PRECIPITATION, STREAM FLOW AND RUN-OFF

(a) *Precipitation*

The word "precipitation" as used in Meteorology includes all moisture that reaches the earth, whatever its form—rain, snow, sleet, or hail. The most significant of these are rain and snow. Throughout the Lake Erie-Niagara Peninsula

region the average annual precipitation is 33.7 inches, determined from local meteorological stations with records of observation ranging from 21 to 45 years.

The Big Creek area is approximately in the centre of this region and its average annual precipitation is estimated at 34.3 inches on the basis of data from stations within and adjacent to the area, with periods of observations ranging from 18 to 20 years.

(b) *Stream Flow*

Stream flow, or run-off, consists of surface flow and ground water which are constantly entering the stream channel along its course, and is broadly the excess of precipitation over evapotranspiration and deep seepage. Surface flow is that portion of rainfall, melted snow and/or ice which reaches the stream channels directly by flowing over the ground surface.

Ground water flow (percolation) is going on continuously and is responsible for maintaining the flow in streams during periods of drought. This portion is usually classified as base flow.

Measurements of stream flow have been recorded at Port Rowan near the mouth of Big Creek for a period of 29 months only, during the years 1945 to 1948. This observation point was abandoned during 1948, owing to the unstable nature of the cross-sectional area at the measuring point, but four new hydrometric stations were subsequently established in the Big Creek area.

2. MAXIMUM FLOWS

(a) *Spring Freshets*

Where structures such as dams are concerned, it is not the ordinary or average flows that are significant, but the unusual or exceptional ones that may have occurred in the past or may reasonably be expected to occur in the future. These flows provide the basic design criteria for all major water-impounding structures whose failure could result in the loss of life and destruction of property. Therefore it is necessary, in the analysis of the data available, to forecast probable maximum conditions in direct relation to the human and economic factors involved.

From the records available for Big Creek it appears that maximum flows have occurred during the spring freshet months of March and April. The maximum recorded was 1,630 cubic feet per second and occurred in March, 1956.

This is a very low rate of run-off for a spring freshet flow and indicates the high retention capacity of the watershed.

(b) *Other than Spring Freshets*

In recent years it has become apparent that flood run-off resulting from rainstorms without the aid of melting snow and ice is more significant than, and in many instances of a magnitude in excess of, that experienced in the spring freshet period.

3. UNIT HYDROGRAPHS

Where reasonably accurate rainfall and stream flow records are available, the use of the unit hydrograph method provides a solution to the problem of design storm flow.

Stream flow records for the Big Creek Region are of short duration, and observations are made once or twice a day, except on occasions when readings are taken at lesser time intervals of one or two hours during periods of high water.

The gauges in operation at the present time are of such recent establishment that sufficiently accurate rating curves have not been developed to provide reliable flow data for the purpose of determining design storm flows by the unit hydrograph method alone.

There is one rainfall observation station in the Big Creek watershed at Delhi, and others at Waterford, St. Williams and Simcoe within the boundaries of the Big Creek Region. To determine the actual rainfall duration period of storms it was necessary to depend on records of the self-recording gauges at London and St. Thomas.

4. DESIGN STORMS

The "design flood" flow is generally referred to as the hydrograph or peak discharge that is finally adopted as the basis for the design of any particular structure.

The flood damage in the Big Creek Region has not been serious. Actual records show that excessive stream flow usually occurs during the late winter and early spring seasons. However, it is known that a storm such as occurred over Southern Ontario in October, 1954, if concentrated over the Big Creek area, could produce run-off considerably in excess of anything previously experienced.

5. LOW FLOWS

The available streamflow records for all the gauges in the Big Creek Region show that periods of low flow usually occur in July, August and September, and occasionally in October, November and December. A flow of 6 cubic feet per second at Delhi was recorded in August, 1956.

CHAPTER 4

WATER PROBLEMS

1. INTRODUCTION

At the present time, most of the water demands in the Big Creek Region are met by the ground water storage. Most farms draw water from wells, a practice which is also followed by larger communities. Simcoe, for instance, draws 660,000 gallons per day from springs or wells and Waterford draws 110,000 gallons per day from springs. Delhi, on the other hand, takes 200,000 gallons per day from North Creek while Port Dover and Port Rowan pump directly from Lake Erie. Both streams and wells are used for livestock watering purposes whereas wildlife, of course, uses only the natural source. Irrigation water is obtained primarily from dug-out ponds which are fed by the ground water. Concentrated pumping from streams does occur, quite often resulting in dry streams for a few days.

The demand for water in commercial and industrial establishments is not great at the present time and is chiefly confined to the processing of agricultural products such as fruits, vegetables and dairy products. However, with the industrial boom presently under way in Ontario it is expected that the demand for water for these purposes will increase rapidly in the next few years.

Many of the municipalities and most of the commercial and industrial establishments depend upon the streams to carry away their waste products and, while this has not created much of a hardship on the other water users as yet, it will certainly become worse unless suitable measures are taken to prevent it.

Problems do exist to some extent now with the multiple uses of the water and, for any conservation scheme to be a success, much co-operation, tolerance and understanding should be exercised by all parties concerned.

2. POLLUTION

At the time of the survey made in 1955, pollution could not be considered a major problem in the Big Creek Region as a whole. However, three sections of the river courses did show serious pollution. Delhi, on Big Creek, provides primary and secondary treatment to its sewage and has one of the most efficient sewage treatment plants in the province. A station examined about 1½ miles below Delhi on the main stream showed a wide variety of fauna and no important indicators of pollution. The whole creek and its tributaries appeared to be in exceptionally good condition apart from a road crossing a quarter of a mile south-west of New Durham. At this road crossing in North Norwich Township, there was considerable pollution from cattle. There is a chicken processing plant at New Durham and it is important that wastes from this plant should not reach the creek, particularly since the stream is reduced to standing pools in dry summers and there would not be a satisfactory dilution. Clear Creek in Houghton Township and Dedrich Creek in South Walsingham Township were both in good condition when examined. Young Creek in Charlotteville Township was in excellent condition, but there was a dump of garbage and other debris at the road crossing immediately west of Walsh. It is possible that this dump might pollute the stream.

(1) *The Lynn River*

a. Simcoe

When the 1955 biological survey was made, no pollution was observed at any of the 12 "reporter stations" on the Lynn River above Simcoe, but the river was in a severely polluted condition for several miles below Simcoe.

b. Port Dover

While the problems of pollution at Port Dover are chiefly dealt with by septic tanks, there is little doubt that there are a number of sanitary sewers which enter into the storm sewer and thus into the Lynn River without any treatment. There are also a canning plant and fish and chicken processing plants whose effluents pass directly into the river. The severe pollution at Port Dover is a serious deterrent to the attractions of Port Dover as a recreation centre.

(2) *Nanticoke Creek*

During the survey Nanticoke Creek was observed to be polluted, just above its mouth, by debris from a fish processing plant.

3. FLOOD PROBLEMS

Chapter 2 of this report gives an account of the flood history in the Big Creek Region Watershed. Unfortunately, missing records leave long periods during which no information regarding flooding is available.

The watershed is fortunate, however, in that its topographic and physical characteristics tend to prevent the serious floods which occur in most other watersheds.

Flood damage can be reduced by an early warning system which would warn the downstream areas of the impending flood. The establishment of such a system should be encouraged. Proper land use and good conservation practices in general will aid in reducing fast spring run-off and consequent floods. Care should be taken

in the future that commercial and residential development does not extend into areas subject to flooding. Bridges and roadways constructed across valleys should be designed to handle the expected peak flows and offer as little obstruction as is economically possible.

4. IRRIGATION

Irrigation of tobacco is widespread throughout the area wherever soils of the Fox, Plainfield or Bookton sand types occur. The heaviest concentration is in the North Creek area where the percentage of farmers irrigating has risen from almost zero per cent in 1952 to over 60 per cent today. The rate of increase reached its peak in 1955, mainly due to the dry weather experienced during that year. Although there has only been a 5 per cent increase in the number of irrigation systems during the past two years, it is significant that there has been a 20 per cent increase in water sources, as the farmers have gone ahead and dug ponds in anticipation of dry weather. Should a drought similar to that of 1955 be repeated, it is almost certain that the acres irrigated would exceed those of 1955.

At present, irrigation is limited mainly to tobacco. It is conceivable, however, that with the expected growth in population, farmers will find it economical to irrigate other crops such as vegetables, potatoes and pasture.

During the dry summer of 1955, a study was made of the flow in the various rivers of the Big Creek Region. It was found that where streams had their headwaters in sand plains, flow was maintained longer than those which rose in clay plains. Big Creek and its tributaries maintained a fairly steady flow in most cases. This was also partly true for the Lynn River. Both of these rivers lie in sand plains. Black Creek, on the other hand, was almost completely dry on September 14. In this case, the stream flows through a clay plain.

This phenomenon is due to the sandy soils being able to absorb more precipitation and thereby reduce the surface run-off. This builds up the ground water storage which feeds the streams during periods of no precipitation. The clay soils, on the other hand, have low infiltration rates and consequently less available ground water. From this it can be seen that during drought periods stream flow relies on the amount of water stored in the aquifer. This flow is required to dilute effluent from sewage disposal works and provide water for municipal, livestock and wildlife needs. Should the flow be too little or the stream dry up completely, serious consequences could result.

These facts must be kept in mind when considering possible water sources for irrigation needs.

CHAPTER 5

AVAILABLE CONSERVATION STORAGE

1. GENERAL

Detailed topographic maps of the Big Creek Region were examined for suitable reservoir sites. Altogether, 21 sites were selected and examined in the field, of which 12 appeared to be suitable for reservoirs. Of these, three were selected for more detailed study which included surveying and preparing contour maps.

The selection of these three sites was based on one prime factor, namely, the need for a storage reservoir to compensate for the water being used to irrigate the tobacco lands in the North Creek area. This is essential for the maintenance of stream flow for downstream uses such as domestic and industrial water supply,

dilution of sewage effluent, livestock requirements, etc. (This problem of streams running dry due to excessive pumping for irrigation was experienced during the dry summer of 1955.) Other considerations were flood control, recreation, wildlife and low storage costs.

2. RECOMMENDED RESERVOIR SITES

(a) *North Creek Reservoirs*

Since the North Creek presents the most urgent problem of a water shortage due to irrigation during dry summers, suitable storage basin locations in this area were investigated. Two sites were selected, one running between Lots 42 and 43 in Concession I NTR of Middleton Township and the other in Lot 42 of Concession II NTR. (The former will be referred to as the lower site, and the latter as the upper site.)

Two possible schemes are proposed. Scheme A would involve building one large dam to an elevation of 760 feet at the lower site. Scheme B would require two dams being built; the lower to an elevation of 745 feet and the upper to the 760-foot elevation.

(1) *Scheme A*—consists of a single dam 57 feet high and 400 feet long at the lower site. This would raise the water level to the 755-foot elevation, eliminating the upper damsite which would be flooded to a depth of 20 feet. The reservoir would extend back 2.2 miles from the dam and provide a total of 2,100 acre feet of storage with a surface area of 160 acres. The buildings in the north half of Lot 42, Concession I NTR, would have to be removed, and a 1,000-foot stretch of road in Lot 42 between Concessions I NTR and II NTR would be flooded.

The estimated cost of Scheme A, assuming that suitable impervious material for the core-wall is at hand, is $528,187.

(2) *Scheme B*

The *lower site* is located about 600 feet north of Highway No. 3 where the top of the valley narrows to about 500 feet. An earth dam with concrete spillway placed at this site would be 315 feet long and 42 feet high above the stream bed which has an elevation of 703 feet. The reservoir would extend 1.5 miles upstream and have an average width of 400 feet, giving a surface area of 54 acres and a storage capacity of 596 acre feet.

The only building affected is located in the north-east quarter of Lot 42, Concession I NTR. Although it will not be flooded, it is probable that the high water line will be fairly close to the building.

The concrete culvert in Lot 42, Concessions I-II NTR, should be of adequate size; however, it appears to be in only fair condition and may have to be replaced.

The valley is at present heavily wooded with scrub and a few good elm and pine stands.

The *upper site* is located in Lot 42, Concession II NTR. This dam would be 295 feet long with the crest being 25 feet above the stream bed elevation of 735 feet. A 5-foot freeboard would be provided, making the spillway elevation 755 feet. It would be similar to the lower dam in construction. The reservoir would extend 0.8 miles upstream with an average width of 350 feet. It would have a water surface area of 50 acres and a storage capacity of 280 acre feet.

Although the reservoir would not flood any buildings or valuable crop land, it would necessitate the raising of two roads, viz., the South Norwich townline road adjoining Lot 41, Concession II NTR, Middleton Township, and the road between


DRAINAGE AREAS
BIG CREEK 281.0 SQ MI
CLEAR CREEK 26.8
DEDRICK CREEK 32.3
LYNN RIVER 109.8
NANTICOKE CREEK 7.1.0
YOUNG CREEK 19.4
AREA A. 4.0
AREA B. 11.3
AREA C. 28.4
AREA D. 15.9
AREA E. 111.2
TOTAL AREA = 610.3 SQ M
TEETERVILLE DAM
WATERFORD
SUTTON DAM
SIMCOE
DELHI
LEHMAN DAM
PORT DOVER
VITTORIA DAM
VITTORIA
LANGTON
NORMANDALE
PLAN OF
BIG CREEK REGION WATERSHED
SHOWING
CONSERVATION RESERVOIRS
LEGEND
A
B
C
D
E

Lots 40 and 41 of the same concession. These works would each be approximately 300 feet in length. The valleys are well wooded and would require clearing.

The two dams would provide a total storage capacity of 876 acre feet at an estimated cost of $423,086. If suitable impervious core material is not readily available the cost would be about $481,387. The soil in the vicinity of these two sites is believed to be of a light sandy texture and soil borings would be required to determine the type of construction for dams at these sites. There is a clay deposit east of Delhi which could be used as a source for core material, or a watertight cut-off wall of steel sheet piling could be constructed.

(b) *Delhi*

A third reservoir site was surveyed just north of the town of Delhi on Big Creek. The damline is located on the lot line between Lots 23 and 24 of Concession X in Windham Township. The dam would have earth-fill embankments with a concrete spillway fitted with steel gates. The crest would be 35 feet above the stream bed, allowing for a 5-foot freeboard. This would give a water level elevation of 725 feet. The structure would be 450 feet in length. The reservoir would extend 2.5 miles upstream with an average width of 460 feet, a total surface area of 182 acres and a storage capacity of 1,405 acre feet.

The valley is densely wooded with underbrush, poplars, alders and some merchantable cedar. The valley floor is wet and swampy with a number of single-track roads in poor condition passing through it. Should the dam be built, the road dividing Concessions IX and X of Windham Township would be flooded to a depth of 8 feet for a distance of almost 2,000 feet (where it passes through Lot 23) and consequently would have to be abandoned. Another road would have to be raised for a distance of about 200 feet in Lot 22, Concession IX. The timber bridge at this point is in good condition and should have about five feet clearance when flooded to the 725-foot elevation. A third crossing on the line between Concessions VIII and IX in Lot 22 consists of a concrete and steel bridge in good condition. The reservoir would narrow at this point, thereby preventing any flooding of the road.

3. OTHER RESERVOIR SITES

(a) *Glenshee*

This site is located on Trout Creek in Lot 1, Concession X of Charlotteville Township. A detailed survey was not made; however, from the topographic maps, it is estimated that a dam 24 feet high would form a reservoir 1.6 miles long, covering 77 acres, with a storage capacity of 608 acre feet.

The damsite is heavily wooded and the pond area is overgrown with weeds and bush. Farther upstream is located a corrugated iron arch-type culvert under a sand road. This culvert replaced an old timber dam and bridge but the original pond area is silted up to the level of the old spillway. The new dam would flood over these structures.

(b) *Langton*

This site is located on the Venison Creek in Lot 6, Concession XIII, North Walsingham Township. From topographic maps it is estimated that a 30-foot wall would store 1,056 acre feet over an area of 211 acres. The reservoir would be a relatively short wide body of water with the dam wall being 475 feet long.

The valley has steep banks which are well wooded and will require clearing. An old dam is located farther upstream at the first road crossing. Nearby are two

good farm buildings and a concrete-block house. Should the dam be built, its height could be such that these buildings would not be flooded unless necessary.

(c) *La Salette*

An estimated 3,264 acre feet of storage could be obtained by building a 23-foot high dam on Big Creek, just north of the Michigan Central Railway tracks in Lots 20 and 21 of Concession VIII in Windham Township. The dam would be about 660 feet long and would create a reservoir 1.8 miles long with an average width of 680 feet.

Suitable impervious fill material would probably have to be brought in from some other area since the soil at the damsite is of a sandy texture. The valley is well wooded with heavy bush and some merchantable timber. There are two road crossings farther up the river which would be flooded if the reservoir were raised to the 750-foot elevation. Since no detailed survey has been made of the site, it cannot be said here whether or not new bridges would have to be built. In all probability, the existing structures would suffice; however, the road approaches would have to be raised.

Farmers are pumping water from Big Creek at this location to irrigate their tobacco crops. By constructing this dam, an adequate supply will be stored and stream flow maintained.

(d) *Marston*

This site is located on Venison Creek, in Lot 3, just north of the road separating Concessions VIII and IX in North Walsingham Township. The reservoir would lie about one mile west of the village of Marston.

The valley at the site has steep high banks and is suitable for a 30-foot dam, 425 feet long. Suitable clay material is available. The reservoir would be 2.0 miles long with an average width of 635 feet, giving a total storage of 3,280 acre feet covering 192 acres.

The valley is well wooded with dense undergrowth. There are three bridges in the area, one of which would definitely be flooded by the proposed reservoir. The valleys at these points are V-shaped with steep wooded banks.

(e) *New Durham*

This damsite is located just east of the village of New Durham in Lots 21 and 22, Concession IX, Burford Township. A small dam, 9 feet high, would create a 58-acre pond storing 96 acre feet of water.

The area consists mainly of pasture land on a fairly heavy clay soil. There is no tobacco being grown in the immediate vicinity but water for irrigating other cash crops may be required in the near future.

(f) *Oriel*

This location is suitable for a small dam 13 feet high and 790 feet long. The site is about 1½ miles south of Oriel in Lot 11, Concession VIII, East Oxford Township, and has a drainage area of 3.6 square miles.

The dam would create a lake covering 77 acres and storing 256 acre feet. The area at present is cultivated and planted to tobacco right to the water's edge. Since this site is in the headwaters of Big Creek, there was no defined stream course where the observation was made. There were a number of standing pools of clear, cold water, however, some containing trout fingerlings.

(g) *Venison*

This site lies in the tobacco-growing district to the south-west of the village of Walsingham. It is located on Venison Creek about one mile upstream from its confluence with Big Creek.

A 25-foot dam, 581 feet long, built just west of the road in Lot 7, Concession V, South Walsingham Township, would create a 96-acre lake storing 800 acre feet of water. The valley is broad and flat and contains some fair pasture land. The area is fairly well wooded with scrub brush and a few large maples, elms and poplars, with scattered pine and cedars along the slopes. The stream follows a well-defined course with no signs of serious flooding.

The reservoir would back up to two bridges, which would have to be investigated for possible flooding. The first is a timber bridge with 5.9 feet clearance and the second is a steel structure with 13.2 feet clearance.

(h) *Wyecombe*

This location is on a tributary of Big Creek, just north of the road in Lot 21, Concession XI, North Walsingham Township.

A 40-foot wall 425 feet long would flood 154 acres with 2,240 acre feet of water. The reservoir would back up to the roads to the north and to the west of the damsite and possibly would flood the existing 30-inch diameter corrugated culvert. The roads themselves, however, would not be flooded since they have 33 feet or more fill above the existing water level. Since the road embankment has steep slopes, reinforcing or extra fill would have to be placed to bring the slopes to the correct angles so as to prevent eroding.

The valley is V-shaped and is densely wooded with good elm, maple and birch.

(i) *Woodhouse*

This site is located on a tributary of Black Creek in Lot 9 of Concession IV, Woodhouse Township.

A total of 211 acres would be flooded by a dam 32 feet high and 425 feet long, giving a storage capacity of 2,376 acre feet. With a small drainage area of 2.9 square miles, this reservoir would probably not fill to capacity each year but a reserve water storage could be built up during wet years for use in times of drought.

No evidence of tobacco being grown in the vicinity was observed. The valley divides into two broad, flat fingers. The area is mainly used as pasture and is scattered with elms and willows. At the time of the observations there was no flow; however, there were indications of previous flooding.

(j) *Marburg*

This site is located on a tributary of Black Creek in Lots 16 and 17, Concession IV, Woodhouse Township.

The topography is suitable for a dam 27 feet high and 540 feet long, which would impound 2,460 acre feet of water covering an area of 269 acres.

The reservoir would be divided into two arms, each extending back over two miles from the dam.

With a small drainage area of 6 square miles this reservoir would probably not fill to capacity each year.

(k) *Tyrrell*

Located just north of the Marburg site in Lot 16, Concession XII, Townsend

Township, a dam 22 feet high by 685 feet long could be constructed at this point to impound 1,630 acre feet of water.

The reservoir would flood about 230 acres of land and interfere with one roadway. The drainage area above this site is only 2.6 square miles and would not fill the reservoir to capacity during years of low spring run-off. However, being at the headwaters, this site is ideally situated for a summer flow reservoir.

(1) *Rockford*

This site is located in Lots 18 and 19, Concession XIII, Townsend Township, about one mile south-east of the Tyrrell site. This is one of the best sites in the watershed from the amount of storage capacity available but, being located near the headwaters with a limited drainage area of only five square miles, there would not be sufficient run-off every year to fill it.

A dam 36 feet high and 1,060 feet long could be constructed to impound 6,860 acre feet of water. The reservoir would be 2.5 miles long with a surface area of 480 acres. Sections of three separate roads would be flooded but with such a large potential storage capacity the height of the dam could be reduced to minimize this damage and still provide sufficient storage to serve the needs of the area.

It is not suggested that any of the reservoirs in this group be built at this time, but the above sites are mentioned in order that the Authority may be aware of their potential should some less important development, which would interfere with the use of these areas for water storage purposes in the future, be under consideration.

All of the above data were obtained from topographical sheets and a brief visual examination of the areas.

4. LEHMAN DAM

Since the town of Delhi at present relies on North Creek for its domestic water supply, some concern has arisen over the low stream flows during the dry summer periods when heavy irrigation pumping occurs. This has led to the investigation of new water supplies, one of which is being provided by the restoration of the old Lehman Dam on North Creek immediately south and west of the town limits. This site is adjacent to the existing water filtration and pumping plant of the Public Utilities Commission of the town of Delhi. The storage required is based on the estimated population in 1975 being 5,400 (1957—3,018), and calculated for irrigation periods of thirty and forty days, assuming that during this time the flow in North Creek is sufficient to compensate for the net evaporation loss from the reservoir. The daily consumption per capita is estimated at 100 gallons. The storage required for the thirty-day period in 1975 would be 10,950,000 gallons while 14,600,000 gallons are required for the forty-day period. The reservoir is designed to store the latter figure which is equivalent to 54.3 acre feet.

The total cost of the scheme is estimated at $165,000.

CHAPTER 6

COMMUNITY PONDS

The advantage of community ponds are twofold. First, they conserve water which is a necessary attribute in any conservation program. Second, they provide a place of recreation for the members of the rural communities. Unlike farm ponds, they do not provide facilities for a single family but rather are developed to

accommodate the needs of large groups of people. Besides storing water and providing fire protection, these ponds are used for swimming, boating, fishing, skating and picnics.

Several factors should be kept in mind when investigating the possibilities of developing a community pond. First of all, the pond should be able to accommodate the expected number of people using it. It should be easily accessible and close to the community. There should be sufficient area for parking and picnicking. Adequate facilities for sanitation, change rooms and possibly confectionery should be available. The area should be free of hazards and safe for swimming, boating and skating.

Some of the above facilities were provided to a degree in earlier days by the community millponds. For generations these were the gathering places for small boys who used to swim and fish in the summertime and skate in the winter. Today, however, the mills have been converted to electric power, thereby eliminating the use of the power obtained from the water of the pond. This has resulted in the dams falling into disuse until today, in most cases, they have deteriorated to a condition beyond repair. Many have been washed out completely and the ponds have disappeared. However, since the millponds to a large extent fulfil the requirements mentioned earlier, they should be given first consideration as sites for possible community ponds.

In addition, many of the old buildings have much historical value attached to them which could be incorporated into the scheme of things.

Very few of the 60 or more millsites existing in 1865 remain today. In order to restore most of the ponds, new dams would have to be built. One pond which is still in good condition is the Backus Pond located north of Port Rowan. The original mill still exists and the pond and surrounding area have already been acquired for development as a public recreational area.

Unfortunately, the topography of the region does not lend itself ideally towards good pond sites. The valleys are too deep and the stream gradient too steep. The region has been inspected for community pond sites and 30 were located, well distributed throughout the region.

CHAPTER 7

FIELD SURVEYS

All surveys made during this study were of a preliminary nature.

Twenty-one locations were selected from topographic maps as possible sites for reservoirs. These were examined in greater detail and three were selected to be surveyed for the preparation of contour plans by stereo-projection from aerial photographs. These were named North Creek Scheme "A"; the Upper and Lower North Creek, Scheme "B"; and the Delhi Reservoirs. The contour plan of the Delhi reservoir was drawn at a 400′ to 1″ scale with 10′ contour intervals from field survey data and aerial photographs. The horizontal scale of the photographs was accurately determined by check-chaining stretches of roads or fence lines which could be readily identified on the photographs and comparing these distances with the measured distance on the photograph.

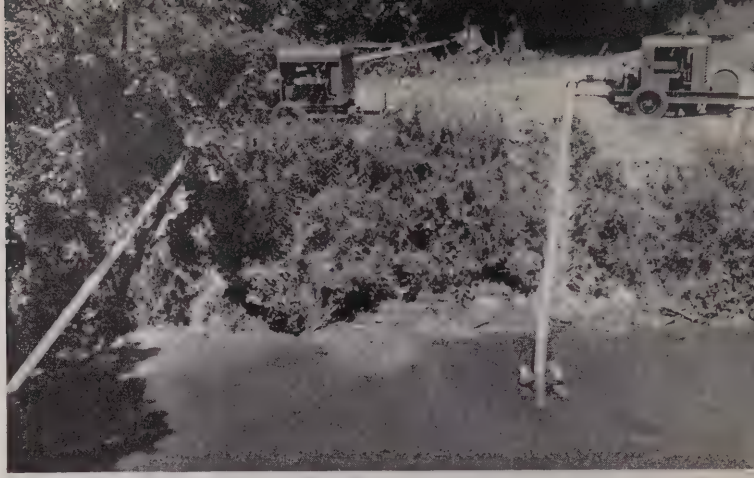
The vertical control for the mapping was done by establishing bench marks at the upper and lower ends of the reservoir by means of checked lines of levels. The intermediate spot elevations were obtained by using Wallace and Tiernan type

F A. 176 precise altimeters. The storage capacity of the Delhi reservoir, measured from the plans prepared by the above method, is believed to be correct within five per cent.

The contour plans for the North Creek reservoirs were prepared from aerial photographs using a Fairchild stereo-comparagraph. Bench marks at the upper and lower ends of the sites were established and a line of levels run around the perimeter of the reservoir areas. Points at convenient intervals were identified and their elevations recorded. These points were used as the starting points for lines of altimeter readings which formed a cross-section pattern over the valley. Elevations of prominent points identified on the photographs were again recorded. The contour plans were then completed by using a stereo-comparagraph to tie in the contour lines between the recorded elevations. The scale in this case was 500′ to 1″ with ten-foot contour intervals. The horizontal scale was determined in the same manner as the Delhi reservoir. The storage capacities determined are believed to be correct within 20 per cent, which is acceptable for this preliminary survey.

Levels run in this survey commenced at G.S.C. Bench Mark No. 1705 in Woodstock and were carried through to all the reservoir sites. Altogether, 47 bench marks were established along approximately 20 miles of base levels. These bench marks will expedite any further work in the area, particularly should it be decided to proceed with the construction of a reservoir.

The mouth of Big Creek as it empties into Lake Erie.



Two pumps drawing water directly from a stream to irrigate tobacco.

A typical dug-out irrigation pond in the Delhi area. Note the pump in the background.

Vittoria Dam — June 8, 1956. Charlotteville Twp., Norfolk Co. ½ mile east of Vittoria.

WILDLIFE 5

CHAPTER 1

INTRODUCTION

In the Big Creek Region, as in much of the rest of agricultural Southern Ontario, the most important single factor limiting the wildlife population is the inadequacy of good wildlife habitat. In a few cases over-hunting, over-fishing and predation have contributed to the depletion in its final stages. But the size of the populations is more often determined by the availability of suitable living quarters for the game and other wildlife. The Department of Lands and Forests exercises control over the amount of hunting and fishing and to some extent over the amount of predation. Considerable research is still being carried on in the methods of management of wildlife populations.

If food and cover of the proper kind and quantity are available most game species of wildlife should be able to provide an annual increment in their numbers to permit reasonable crops of fish and game to be harvested.

This report covers only the distribution of stream fish, the biological conditions of the streams, and the most generally acceptable methods of improving farms for wildlife, together with a list of birds that may be expected to nest in the area and mammals which have been found or are likely to be found in the region. The report on pollution of the streams of the region, which is based chiefly on the biological survey of the streams, will be found in Chapter 4 under Water Problems in the section "Water" of this report. A general survey of the more obvious spawning areas of the sea lamprey, which was made in 1955, is included.

CHAPTER 2

FORMER CONDITIONS

In the days when forests covered all the area of the Big Creek Region, wildlife conditions were very different from what they are today. The changes that go hand in hand with a swing from forest to agriculture always mean that the animals are called upon to face a new set of conditions which inevitably affects their way of life.

To some species this means lessened food supply. To others it means fewer nesting sites. To others it means warmer streams. To others it means greater exposure to severe weather conditions. The animals that are affected adversely have either to adapt themselves, suffer reduction in their numbers or face destruction.

On the other hand there are animals that find the change from forest to farmland beneficial. Many prefer life in open, grassy fields to life in the deep woods. Many that cannot tolerate forest conditions thrive in cut-over areas. Many seem to prefer a proximity to man and his buildings. Thus many forms of wildlife benefit when the forests are opened up, when crops are planted, when cities rise.

So, to some degree, the otter, moose, marten, fisher and lynx have been supplanted on the Big Creek Region by cottontails, jackrabbits, woodchucks, red foxes and skunks. These are all mammals that were scarce or entirely lacking in the region before the forests were reduced. Corresponding revolutions have occurred in other groups of wildlife.

The popular conception of primeval Canada as a land filled with great numbers of wildlife of every description is probably quite incorrect. The maximum population of game and the larger forms of wildlife almost certainly occurred a few years after the country was first settled, when the greatest diversity of habitat existed. In the following years additional cutting, burning and grazing of the remaining woodlands, pollution of the streams and too intensive hunting, trapping and fishing combined to take their toll.

The species which was probably subject to the most extensive trapping was the beaver. In the course of examination of surveyors' records for other sections of this report it was found that there were numerous reports of beaver dams and beaver lodges. If the records were complete, a map of these might be of interest, but several of the surveyors did not report beaver dams or signs of beaver at all. There are, however, enough records to show that beaver were formerly extremely common in the Big Creek Region.

CHAPTER 3

STATUS OF PRESENT SPECIES

Although agricultural use of the land, soil conditions and woodland types are not uniform over the whole of the Big Creek Region, and although the more southern portions are affected by their proximity to Lake Erie, the wildlife conditions are, in general, fairly uniform, apart from the Turkey Point Marshes and the Long Point Marshes.

Comparatively little study has been concentrated on the wildlife of the region. Because of the many and varied forms of migrating birds that may be found there in spring and fall the peninsula of Long Point, extending into Lake Erie from near the mouth of Big Creek, has received a good deal of attention from visiting naturalists during the past three or four decades. During the summers of 1927 and 1928 the Royal Ontario Museum of Zoology, Toronto, established field parties on the Point to carry out a study of its fauna. The results of the survey were published as "A Faunal Investigation of Long Point and Vicinity, Norfolk County, Ontario" in 1931.

Since the marshes that surround the mouth of Big Creek actually compose part of the area covered by that investigation, it is safe to assume that many of the species reported by the Museum may be included in a list of animals occurring regularly or occasionally in the Big Creek Region.

It is on such assumptions, together with reports from other naturalists who have visited the area and papers by Anderson, Downing, Saunders and others, supplemented by observations made during the course of the 1950 survey of the region, that the present wildlife report is based. This survey was primarily of a reconnaissance nature and no detailed studies were attempted.

Twenty-one species were either collected or observed during the course of the present survey and fourteen species probably formerly occurred in the region but are absent or very rare at present.

1. BIRDS OF THE BIG CREEK REGION

The diverse habitats and the satisfactory location of the Big Creek Region with respect to the rest of Southern Ontario make it possible to estimate that between 275 and 300 different kinds of birds probably nest in the area or migrate

through it in any given year. A list of these species would be largely hypothetical, and would include almost all the resident and migratory species of Southern Ontario.

The list in the main report includes only those that may be expected to nest regularly in the area.

2. GAME AND FUR IN THE REGION

As with other species of wildlife, no specific study was undertaken, but a few statements of the status of the chief game and fur species are given in the full report.

CHAPTER 4

IMPROVING THE LAND FOR WILDLIFE

The requirements of food and cover for wildlife vary greatly for different species. For example, the Woodcock requires woodlands with a damp open muddy soil and often a grassy alder swale or old pasture alongside, and the species needs no winter cover as it is not in Ontario at that time of year. By contrast the Ring-necked Pheasant uses heavy weed growth, hedgerows, marsh edges and vine tangles in winter, along with ragweed, apples, sumac, grapes, corn and grain as food, and also needs loafing cover, crowing grounds, and nesting and roosting sites in summer. Since there are such widely differing requirements for only two of the many species involved, it follows that the recommendations here listed are those which can be most generally applied by the landowner who is interested in ensuring a crop of gamebirds or a variety of interesting species on his property.

1. WOODLANDS

The elimination of grazing of woodlots would be the most useful single measure in improving the wildlife environment. Reforestation plans are included in the Forestry report. In plantations, up to about the tenth year from planting, the entire planted area is valuable for wildlife. But large blocks of coniferous trees will, at least after the twelfth year from planting, have little or no undergrowth and will, apart from their edges, be comparatively sterile as far as upland game and most forms of wildlife are concerned. The chief improvements to be expected, therefore, will come from good management of the farm woodlot.

2. CULTIVATION PRACTICES

All good farming practices which make a more luxuriant and permanent vegetation will improve the farm environment for wildlife. A few special practices will give more specific benefits. Strip-cropping, mentioned elsewhere in this report, is of particular value since by this means no extensive area is denuded of cover at one time by harvesting. This is of particular value in an area such as the Big Creek Region, where tobacco-growing leaves many fields open much of the year. In the less flat parts of the region, filter strips, either above water-diversion terraces or used as emergency waterways, provide travel lanes and nesting cover for wildlife. Cover crops such as the clovers provide a habitat and food for wildlife in areas that would otherwise be barren during the winter months.

The elimination of brushy fencerows is now becoming more common in the Big Creek Region. Those who are interested in wildlife improvement will find that the inclusion of a few field boundary hedges on the farm will moderate the

effect of winds on crops, serve as travel lanes and cover for wildlife, and harbour large numbers of songbirds which help to control insect pests. Inevitably the presence of boundary hedges on a farm tends to encourage the growth of weeds. This is the price that must be paid for improved wildlife conditions. Rosa multiflora is an excellent hedge-forming shrub. It has a tendency in Southern Ontario to die back in winter, but rapidly forms a dense hedge, which is reported to be proof against cattle and hogs. It provides both cover and food and does not exhaust the nearby cultivated ground. However, in view of its questionable hardiness, it should not be planted in the Big Creek Region without consultation with the biologist or forester of the Department of Lands and Forests, at Aylmer.

3. COVER PATCHES

Field corners are frequently barren of crops. Therefore a fence crossing which embraces the corners of four fields may be made into a haven for ground-nesting species by planting a few trees and shrubs and protecting them. It is important to rid such areas of useless weeds by crowding them out with useful species such as white sweet clover or the normal climax type of open vegetation, which is bluegrass.

4. PONDS AND STREAMS

The importance of water to wildlife is often forgotten. Many farms have at least one low spot where a small amount of work with a scoop will form a dam and a pond to provide nesting and feeding sites for water and marsh birds. If possible, ponds for wildlife should be separate from those intended for irrigation, for cattle or for fish.

The present practice of leaving the spoil banks piled at a steep slope around the edges of new irrigation ponds seems to be a disadvantage to the farmer. Willow cuttings pushed in the ground around hollows will rapidly provide wildlife cover. New water areas are usually very rapidly invaded by aquatic plants, but additional species may have to be introduced. No extensive duck food studies have been made in Southern Ontario. Wild rice may be introduced, but since it is not well adapted to wide variations in water levels, being often sterile in fluctuating waters, it cannot be considered as certain to succeed. The idea has long been current, and fostered by many sportsmen's organizations, that the planting of wild rice is the answer to the problem of how to attract ducks to any area. The fact is that wild rice is of little significance to ducks in Canada except in the fall, and does not provide good cover or nesting sites. The following species which may be easily obtained are recommended as certain to be valuable duck foods. If none of them occur in ponds or shallows with good cover for ducks, they can be introduced.

Sago Pondweed	*Potamogeton pectinatus L.*
Red-Head Pondweed	*Potamogeton Richardsonii (Ar. Benn.) Rydb.*
Wild Millet	*Echinochloa crusgalli (L) Beauv.*
Japanese Millet	*Echinochloa frumentacea (Roxb) Link*
Wild Celery	*Vallisneria americana Michx.*
Knotweed	*Polygonum pensylvanicum L.*
Water-Smartweed	*Polygonum coccineum Muhl.*
Three-square	*Scirpus americanus Pers.*
Great Bulrush	*Scirpus validus Vahl., var. creber Fern.*
Duckweed	*Spirodela sp. and Lemna sp.*

CHAPTER 5

FISH

1. INTRODUCTION

Stream surveys in the Big Creek Region in 1955 were restricted to two types of work:

(a) A general classification of the waters of the drainage basin defining the suitability of the various parts for different species of fish.

(b) A reconnaissance survey of areas which appeared suitable for spawning of the sea lamprey, since this fish is having an important effect on the economy of parts of the Big Creek Region.

2. METHODS

The rivers and their tributaries were visited at 406 stations from half a mile to three miles apart on each stream course. The topographic features of the valley and the erosion, vegetation, volume of flow, turbidity, temperature and type of bottom were listed for each station. At all suitable stations collections of the aquatic insects and other invertebrates were made. At most of the stations collections of fish were also made. The collections were later examined and classified and were used in zoning the various sections of the river, as shown on the accompanying maps.

The mayflies, stoneflies and caddisflies were most useful for this purpose since some of them are reliable indicators of the stream conditions at the critical time of year. Some species are confined to waters which remain cold and usually clear in summer, such as trout waters. Others are indicators of permanent flow or of polluted waters, or of the maximum summer temperatures of the water. Thus the potentialities of a stream for particular species of fish are indicated. The fish collections substantiated these findings at many stations. Eight maximum-minimum thermometers and one continuous recording thermometer were installed at various points in the stream courses in the early part of July and in some cases were kept in place until September. Readings from the maximum-minimum thermometers were taken at intervals of two or three days.

3. THE RIVER VALLEY

The variety of kinds and numbers of fish in a river system depends greatly on the physiographic conditions of the drainage basin. In this region there are three major river systems, Big Creek, the Lynn River and Nanticoke Creek. There are also three lesser streams, Clear Creek, Dedrich Creek and Young Creek, and there are also 27 minor watercourses leading to Lake Erie (some of them including brook trout water) besides the general drainage into the lake which occurs in heavy rains along much of the shoreline.

The major features determining the condition of the six more important streams are as follows. Most of the Region is overlain by sand plains. Apart from its extreme north-westerly section and the clay area near its mouth, almost the whole of Big Creek and its tributaries drain through sand plains. Almost all of Clear Creek and Young Creek also drain areas of sand plains. The west or main branch of the Lynn River drains a large sand plain.

There remain, of the important streams, Dedrich Creek of which the upper basin is sand plain and the lower basin clay plain, Nanticoke Creek which drains chiefly a clay plain (at least up to Waterford), and the east branch of the Lynn

River, known as Black Creek, which also drains mostly a clay plain. A more detailed description of these basins may be found in the Land Use section of this report.

4. PERMANENCE OF FLOW AND TEMPERATURE CONDITIONS

The permanence of flow of the river and its tributaries is shown on the accompanying map "Biological Conditions of Streams". It may be readily seen on this map that the soil conditions described above very greatly affect the condition of the streams. Thus Big Creek, Clear Creek and Young Creek, since they pass through so much sandy land lying over impermeable clay, have much more permanent flow in summer than streams such as Nanticoke Creek and Black Creek, where there is a rapid run-off from clay plains. The first streams mentioned also, of course, tend to be cooler.

Of the 406 stream course stations examined in this Region, 203 or 50 per cent had no flow when examined, although 45 of them still had standing pools.

5. FISH DISTRIBUTION

The following comments summarize the distribution of fish, so far as the 1955 collections are concerned. The sea lamprey's distribution is discussed in a separate section.

The following species were found only in the quiet waters bordering Lake Erie, chiefly in Big Creek, and most of them are more properly considered as lake species:

longnose gar	sand shiner
alewife	black crappie
lake chubsucker	brook silversides
golden shiner	

Brook trout were almost entirely confined to tributaries of Big Creek and of the Lynn River in the sandy sections of the Region and to other small streams in the sand plains, flowing directly into Lake Erie. Some of the brook trout collected may have been stocked in the streams where they were found, but it is probable that most were spawned naturally in these streams.

The mottled sculpin or muddler which is often associated with brook trout water, so far as temperature is concerned, was found at 36 stations. The species is widely distributed in the upper waters of the Lynn River, Young Creek, and Venison Creek and the upper waters and tributaries of Big Creek.

Rainbow trout, which are frequently caught in the fall run in Big Creek (at a season when the field work of the survey is finished), and which should normally be found as fry or fingerlings on some tributaries of Big Creek, were represented in the collections by a single specimen from an excellent trout stream north-east of the "hatchery" stream at Normandale.

Smallmouth bass were very uncommon in the collection from these river systems, except near the mouth of Big Creek. Largemouth bass were noted only in the lower part of Big Creek where they were common, and also near New Durham and in the stream which enters Waterford Pond from the north. Rock bass were generally distributed in the warmer waters. The black crappie was taken on Big Creek three miles above the mouth, and the white crappie was taken two miles above the mouth of Nanticoke Creek. Grass pickerel were found only near the mouth of Big Creek and in the Turkey Point marshes. Northern pike were collected only from Black Creek, above Port Dover, but as these fish are more agile than

most species, they often evade capture in this type of survey. The commonest of the larger fish in the river, both in numbers and distribution, were the white sucker and the creek chub. Most of the remaining species are small minnows and other species of little interest to the angler.

More intensive collecting would certainly have added several small species to the list of fishes.

6. SEA LAMPREYS

A general survey of the permanent waters of Dedrich Creek, Young Creek, Clear Creek and Big Creek was made during the last two weeks of June, 1955, by walking the streams or by canoe, in a search for sea lampreys, lamprey nests, suitable streams for lamprey spawning and areas suitable for ammocoetes. (The lamprey, which has seriously affected the fishing in Lake Erie, was first reported from the lake in 1921). The larger creeks were examined by canoe to determine where the rapids furthest down occurred in case any lamprey barrier was contemplated.

Some of the smaller tributaries of the big streams might be ruled out because, being spring-fed, their temperatures would be too low for suitable environment for the lamprey.

Dedrich Creek

Spawning lampreys have been reported in the past in Dedrich Creek near the Provincial Forestry Station at St. Williams. None was seen in 1955. The dam at Backus Mill is not considered a difficult barrier for lampreys.

Young Creek

This stream was walked June 27, 1955. No evidence of lampreys spawning was noted above Smith's dam at Vittoria, though parts of the stream seemed suitable for spawning. Below the dam about 60 nests were counted.

A trout fisherman reported that lampreys were being thrown out of Young Creek by hand during the spawning run.

Lynn River

This stream was not surveyed. Below Simcoe fairly extensive stretches of gravel riffles occur which may well be suitable as spawning sites.

Clear Creek

Surveyed June 28, 1955.

There is a fairly large dam (now falling into disrepair) within 100 yards of the mouth of Clear Creek. The water spurts over the dam forming large air pockets underneath. It is considered doubtful whether lampreys could overcome this obstacle, but parts of the stream above the dam were walked nevertheless. No evidence of lamprey spawning was found.

For about two miles above the mouth the creek has potential spawning sites though the gravel particles are small. Farther upstream the creek flows through wet, tangled bottomlands with the stream bottom sandy and heavily silted at times.

Big Creek

Surveyed on June 20, 1955 and examined from a canoe on June 22, 1955.

In the pond on the stream above Delhi, large numbers of ammocoetes were scooped out of the pond bottom by Gordon Smith on or about June 26 and one stream bore evidence of lamprey spawning activities.

A part of Young Creek above Vittoria Pond showing excellent depth and cover for brook trout.

One of the early types of sea-lamprey weirs near Delhi, constructed by the Department of Lands and Forests. The present method is to control the run of spawning lampreys by electrical shocking devices. Selective poisons may destroy lampreys without affecting other fish.

The once famous fishing fleet at Port Dover is now much reduced, partly by the effects of lamprey predation on the fish of Lake Erie, but chiefly by the annual variation in the population of the blue wall eye (blue pike).

Below the dam at the No. 3 Highway at Delhi 83 nests were noted, some of which seemed to be "multiple nests". A group of approximately 7 lampreys were noted spawning in one nest here on June 17, of which 4 were speared. Farther down another 67 nests were found, of which 35 were small (4″-12″), the rest being larger (1′-2′), and about 10 nests were noted near Lynedoch.

The more intensively used rapids were on the upper part of this section of stream.

In the remainder of Big Creek to the lake, no evidence of spawning was noted, nor any suitable spawning sites. The stream bottom is almost exclusively sand and silt with the sand-to-silt proportion decreasing fairly regularly from perhaps 10:1 to 1:2. The stream bottom within approximately 6 miles of the mouth seems well suited for ammocoetes.

7. POLLUTION

The condition of the waters in the Big Creek Region, as they were at the time of the survey, and also the present steps to control pollution, are described in the Water section of this report. The summary of conditions was based on the biological studies made during the stream-fish survey and on additional information supplied by the Water Resources Commission of Ontario. The Lynn River below Simcoe is heavily polluted but the oxygen content and perhaps other critical factors are sufficiently improved near Port Dover, so that some of the more tolerant species of fish are able to survive in the river above Port Dover. However, there is severe pollution of both the Black Creek and the Lynn River again at Port Dover, and there is also severe pollution of Nanticoke Creek at its mouth.

8. STREAM IMPROVEMENTS

It is now well known that the greatest improvements in fish populations will come chiefly from improvement of the habitat or living quarters of the fish. There are three ways in which conditions can be altered. The first is improved management of the land draining into the stream, which may help to control floods and to prevent silting. The second is improvement of the stream bed and its banks with structures or logs placed in the stream or by planting trees and shrubs on the banks. The third is a direct increase in the flow of the stream during the period of critical flow between the end of June and the beginning of November. The flow may be increased either by the gradual draw-down of water impounded, or by extra water released into the stream if deep wells are drilled in built-up areas or at industrial plants.

In the Water section of this report several possible sites are recommended for storage of water, particularly on Big Creek and its tributary the North Branch Creek.

Owners and lessees of stretches of the rivers should be encouraged to install low dams and deflectors which will force the stream to dig holes but will not raise the temperature of the water as large impoundments do.

To control bank erosion, owners should be encouraged to make stream bank plantings such as Fragile Willow (*Salix fragilis*) which does not tend to spread out into the fields. Where streams have been ditched the slope of the spoil bank to the streams is often too great. Reworking of some of the spoil banks to a gentle slope, and the sowing of various grasses such as Reed Canary Grass, would certainly reduce the bank erosion.

Fencing of streams from cattle and the provision of rubble at specified cattle crossings are obvious improvements needed.

9. OWNERSHIP

Good trout water open to the public and within easy access of large centres of population is rapidly becoming a rarity. The Big Creek Region, apart from its eastern edge, still has a surprising length of good trout streams. Some governments, for example that of New York State, have already acquired stretches of first-class trout streams so that they will not be lost to the general public. The Conservation Authority might acquire, or urge the acquisition of, one or more good stretches of Big Creek. Venison Creek, a tributary, is a particularly good example.

The Conservation Authority could also give a demonstration of stream improvement for fish, either by installing low dams and deflectors and planting trees for shade, or by constructing one or more by-pass ponds.

10. FARM FISH PONDS

There is ample room for improvement of this type of fishing. The chief research on management of farm fish ponds has been carried on in southern and warmer climates, and therefore the findings cannot be applied without qualification to an area having the climate of Southern Ontario, but some definite recommendations may be made.

From the fisherman's point of view, farm ponds are of two main kinds:

(a) *Trout Ponds*

The first is the cool pond with continuous inflowing water and maximum temperature at the surface of about 75° Fahrenheit with cooler bottom. Ponds of this type are adapted to the production of brook trout or brown trout. They are usually placed near the headwaters and may range in size from about an acre to 8 or 10 acres. Depth should be 10 feet or more in the deepest part.

(b) *Warm-Water Ponds*

The second and commoner type of farm pond is the warm-water pond. Most farms have at least one low spot suitable for a fish pond. It is frequently good practice to have separate ponds devoted to wildlife and fish and to control the aquatic plants in the fish pond.

The Turkey Point Marshes which have been developed privately, with channels dug both for boat travel and to improve the marsh for wildfowl.


BIG CREEK
REGION

All life is a product of the land.

By Which We Live,

Ernest Swift.